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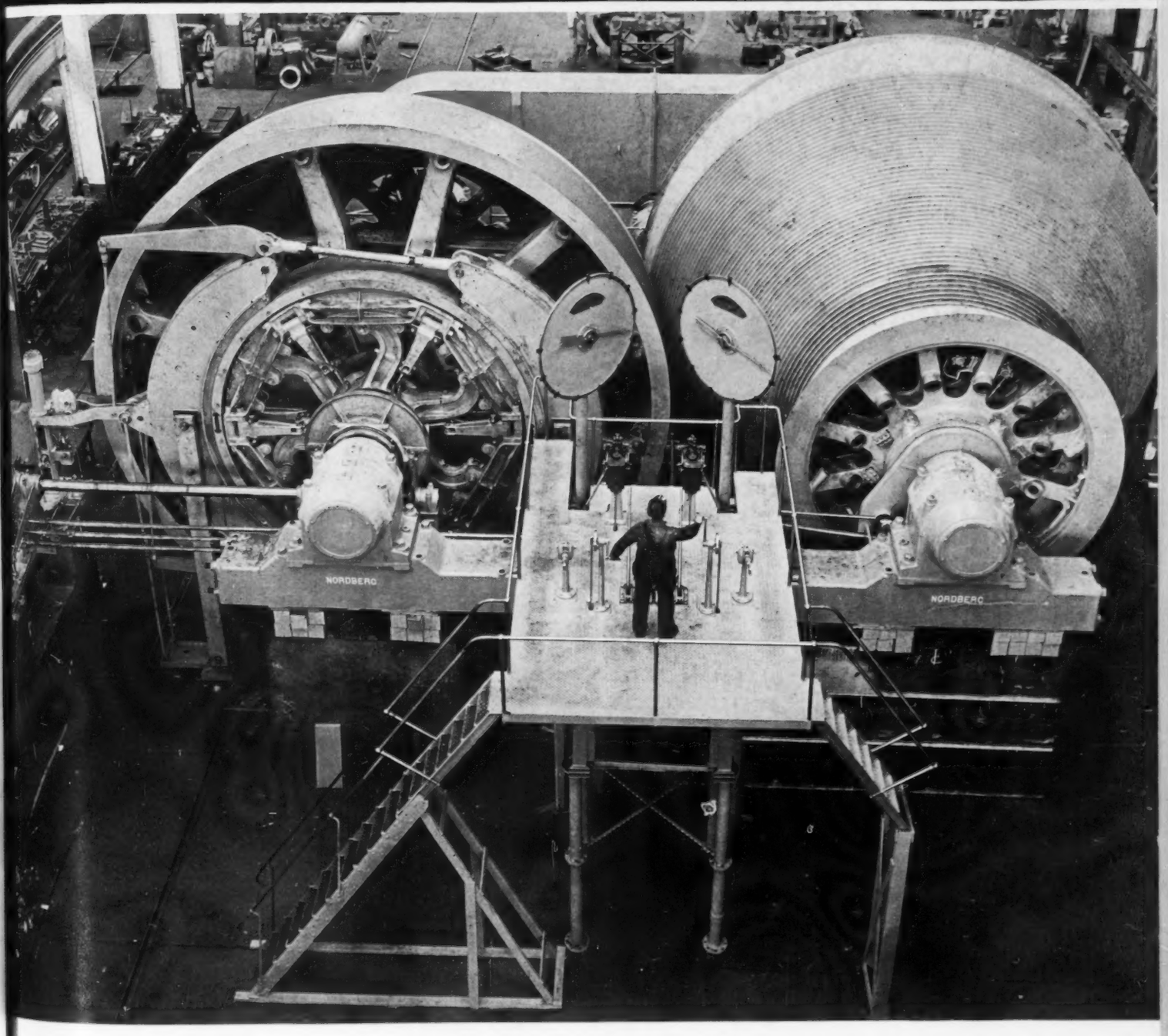
ELECTRICAL WORLD



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What in the World!

Nothing neglected about the NRA-electrical industry relationships these days. All at once there is crowded into immediate consideration the codes of N.E.M.A., N.E.W.A., E.E.I., and N.E.C.A., which, to those who know their alphabets, means everything that is anything is to be represented.

●

It has taken a long while for electric utilities to accept broadly the desirability of offering steam service to metropolitan customer areas. Some of those who have tried it are loudest in their denunciations, even though they still carry on with it. In this issue we present a customer-approach to the buy-or-not-to-buy in hotel supply, where steam must be plentiful and service good.

●

That T.V.A.-private utility contract reminds one of the observation that there never was a good war or a bad peace. When both parties to a deal gain advantages and contentedly retire to the background a happy solution is indeed apparent—and there was, and still is, a great deal to be said for both sides.

●

Specifically, one thinks of that colorful episode of the twelve old ladies ("Electrical World," December 9, 1933, page 739) whose appeal as security owners met A. E. Morgan's modernized version of "Let 'em eat cake." If only the New Dealers and all other reforms could develop a saving sense of humor!

●

Next week comes the A.I.E.E. convention in New York. The editors will in the issue of February 3 offer their interpretation of the significance of the meeting, covering papers and discussions, with an eye on both the present and future.

L. W. W. MORROW, Editor

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Publishing Director

JANUARY 20, 1934

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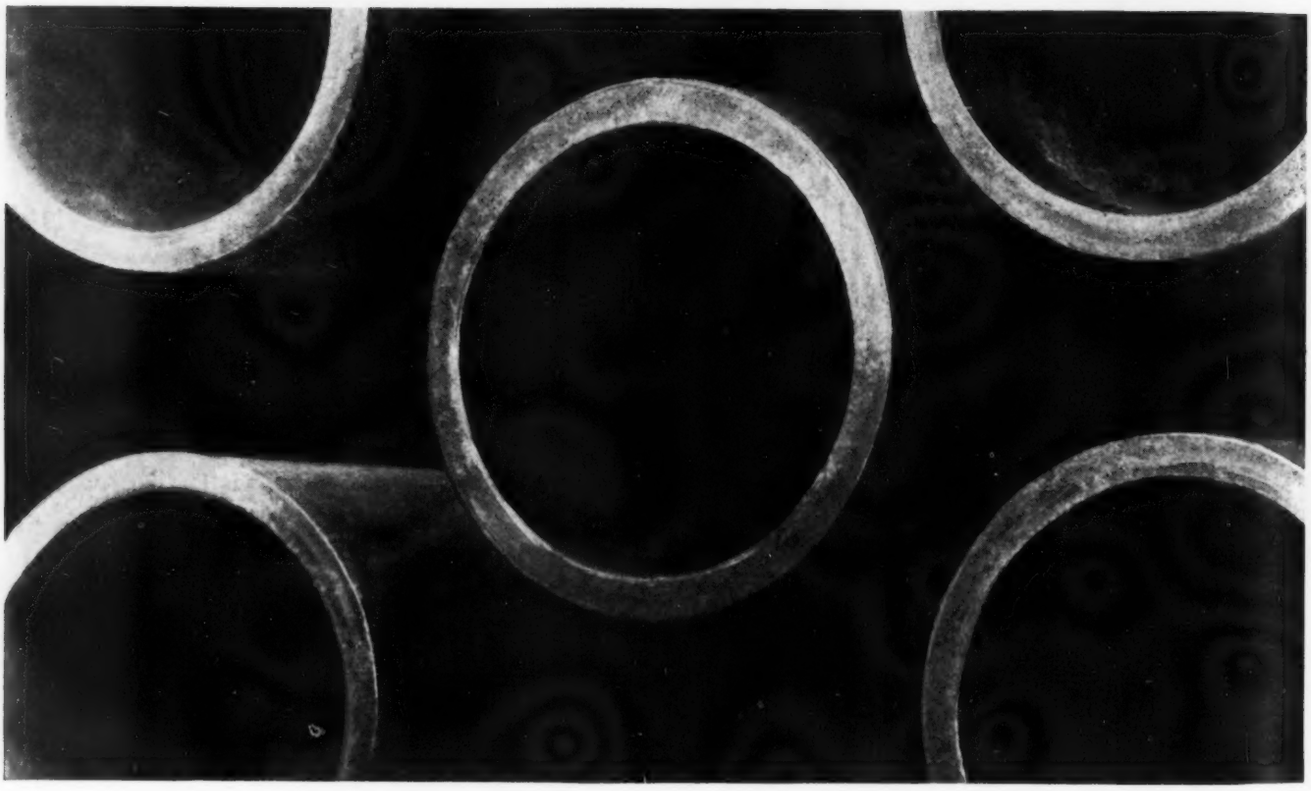

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ELECTRICAL WORLD

Established 1883—McGraw-Hill Publishing Company, Inc.

for the Week Ending

January 20, 1934

L. W. W. MORROW, *Editor*

A Misunderstanding or an Excuse?

JUDGING from the comments of numerous salesmen who are trying to induce industry to modernize their equipment, a serious misunderstanding exists which is greatly handicapping recovery of the capital goods industry, on which so much employment depends. The misunderstanding is that many industrialists believe the government codes prohibit them from purchasing any machinery or equipment which will reduce labor expense. Industry says "we can't justify buying new equipment or replacing old at this time unless it reduces operating expenses more than it increases fixed charges or there will be no net advantage. And how are we to reduce operating expense appreciably without reducing labor expense, which the codes now prohibit?

So far as we know, there is only one limitation on installing new equipment imposed by codes, and not all of them even then; that injunction is to keep under control any expansion in production facilities which will glut the market and make it more difficult for business to recover. Industry still has the right to effect economies in operation by applying new equipment to its processes and by replacing obsolete equipment. In considering either, there are many benefits to chalk up against the fixed charges of making the addition or change: (1) Improved quality of product at same or less expense. This frequently has greater buyer appeal than mere price cutting, which is now placed under taboo by most codes. (2) Uniformity of product. This has a sales advantage, particularly in engineering fields, although it should appeal to any purchaser who has formerly been inconvenienced by its absence. (3) Reduction of rejects. This is a complement of item (2), but it better signifies the saving to the producer as each reject costs as much to produce as the salable articles. (4) Reduction in attendance. This has come about by extension of automatic control or inherent characteristics of new equipment and means a saving in labor expense. (4) Better adaptation to straight-line production or process sequence. Many times this saves formerly non-productive labor and other expenses involved in transporting material in process to the next sequence operation. In some industries it has saved intermediate processes required when there was a lapse between steps in the process. (5) Reduced maintenance expense. How many industrialists have fixed the magnitude of this item, which could be eliminated with new equipment? (6) Greater continuity of operation. Some industrialists might be surprised if they calculated the yearly idle time of men and machines, caused by outage of obsolete equipment, and then assessed unit charges against that loss of productive use.

The list could be extended, elaborated upon and converted into tangible values by any industry which will make a thorough analysis of the benefits of modernization and quit thinking that it will have to get along with what it has. Furthermore, there is grave question whether competition and survival under changed conditions will not eventually force every industry to consider modernization. The longer it is delayed the higher the cost of changeover will be, and meanwhile those who have been wise enough to adapt themselves to changed conditions will have the running start.

A Roman holiday ended suddenly

The utility code hearing at Washington reflected no credit upon those in charge. They first permitted other government departments to challenge the authority of NRA and then opened the door to the expression of opinions and for stump speeches that presented no facts and served merely as scarehead publicity sources. On the second day, however, this door was closed and locked by the revised ruling of Attorney Richberg of the NRA. A responsible group of industry people presenting a code in good faith should not have been subjected to this treatment, nor should NRA have opened its own hearings to challenges of its own authority or by other departments of the government. A code hearing is for the purpose of obtaining testimony as to facts.

Aside from these unfortunate aspects, however, the hearing did produce some facts that should be valuable in drafting the final code. It is very doubtful that this will contain many provisions other than those dealing with hours and wages. Also, there is no possibility of agreement that federal and municipal utilities will adhere to this code of fair practice or will voluntarily associate themselves with the private utility code authority. Nor does the very vigorous opposition of the Federal Power Commission promise acceptance of the power survey proposal. Thus labor, the heart of NRA consideration, will form the essence of any code accepted. At the hearing utility labor representatives presented data and arguments that were weighty. Some modification of the proposed labor provisions appear warranted by the facts presented. Beyond this, however, it would be advantageous to the utilities and their public relations to be more than liberal with respect to labor rules. Utility labor is so vital a part of the business in all its aspects that all possible efforts should be made to put it on a wage and hour basis that is inferior to none.

Further testimony at the hearing also indicated the advisability of getting more representation of operating properties in the code authority, a better geographical distribution of these representatives and a possibility of a better equality of utility, public and labor representation on those subcommittees of the code authority having to do with labor matters or with aspects of the business directly affecting public interest. Undoubtedly the hearing was constructive in these aspects and the final code will be improved as a result of the hearing. Only the "washing of dirty linen" aspects of the hearing were destructive and unnecessary and these could have been avoided by the exercise of control by those in charge of the hearing.

Another good idea appears in England

Out of England have come several valuable innovations that have contributed to market development in our electrical industry. Despite British conservatism and the backwardness—as we see it—of their many voltages, their lack of standardization and their many small publicly owned "electricity undertakings," they have been commercially astute and showed us the way on numerous occasions. They were actively selling by "hire purchases" long before we would take a chance on installment payments in merchandising appliances. They were renting ranges successfully, when we were scoffing at the idea. Now comes another experiment that may be the blazing of another trail.

In the December issue of *Electrical Trading,* published in London, is the story of six electrical contractors in Bedfordshire who have set up a joint financing operation and are co-operating in the sale of house wiring, through their own South Beds Electrical Finance, Ltd. They have quit all cut-price competition among themselves and are helping each other sell better wiring installations, with the same schedule for "extended payments" on an "assisted wiring scheme." They are partners in promoting the demand for household appliances on a standard "hire-purchase plan." Wiring jobs "are costed at so much per point on a price schedule agreed between the contractors." The customer pays down 10 per cent, with a minimum of one pound. The balance is paid in weekly, monthly or greater installments over one to three years. The finance company does the collecting.

Under our laws it is not so simple for a group of contractors to establish a rational schedule of prices and terms. But the public is well pleased in Bedfordshire, and so the volume of these six "electrical trades" has increased materially and they are making more money. Surely it is a sensible arrangement for all concerned. The contractors prosper. They give good quality and service at a

fair price. If not, people would not buy. They cut out the destructive price competition that has cursed the business in this country for so many years.

It is a time of change and our new era of codes has many possibilities. If it can enable the hard-pressed electrical contractors of America to put house wiring on a paying basis and enable them to become active and prospering merchandisers of appliances it will have cured one of the worst ills of our industry. For the easiest way to turn the small contractor into a successful business man is to give him a chance to make money. These six in England have found the way.

Hang the luminaires, but don't shoot the lumens

Photometers of all descriptions, some dubbed by Bassett Jones machine guns for shooting lumens, others as "cream tarts," have done their fair share to make lighting the art it is today. No one will deny them the credit that is their due. But why should the illuminators have built about them a stultifying code of coefficients and indexes to inflict upon the poor light-wishful public that is concerned only with seeing and not with phots, millilamberts and luxes? Those ogres belong in the jungles of Luminaria. In the practical world of pleasingly effective lighting it's all a matter of attitude of mind that is needed and less bewildering technique —especially the attitude of mind in which the illuminating engineer approaches his client.

Mr. Jones has had rich experience in lighting. As a member of the architectural-engineering firm of Meyer, Strong & Jones he has had such buildings as the Empire State to use as his laboratory of practical idealism in lighting. His attitude in these spheres is that of the architect and not of the mathematical economist which he is in his reflective moments when he writes books to puncture the theories of the ruling economists. Like Harvey N. Davis, he views an engineer as "a man trained to base intelligent guesses on insufficient data." And so he knows his data on a lighting project are always insufficient and that he and not the client will have to render the guess intelligent. In doing so it is a mark of cleverness to induce the client to make the decision, but to conjure things so that the decision is the right one.

The client, without knowing it, takes the architect's viewpoint of lighting. The architect with his esthetic obsessions strives to express in gratifying effects what the client seldom (and not always the architect himself) can put into words. Do the machine-gun engineers fit this esthetic picture? It is not a case of shooting the lumens. It's a case of swaying the client, and the gentler the persuasion the better. Gentle instrumental persuaders are available. Armed with these and recognizing the architect's obstinate but very fundamental notion that the most beautiful designs and effects are those which best illustrate the use for which they are intended, the illuminator can make more progress than he has made. This is the plea that Bassett Jones made in a recent address to the illumination group of the New York A.I.E.E. Section and he got the hearty response he deserved.

Impedance values in distribution transformers

The present distribution transformer is an institution that few engineers know or consider. It is so perfect in operating performance that it has become accepted as a standard. Granted this perfection, what about its suitability as a part of the distribution assembly? It was developed and designed for domestic loads at unity power factor when lighting was the only load. For this reason the effect of reactive load was not considered and many of these transformers were built with reactances as high as 4½ per cent because this did not appreciably affect the voltage drop at unity power factor load.

But domestic loads have become heavier and partly inductive because of the types of appliances added. This raises the economic question involved in changing the reactance values of distribution transformers to, say, 2 per cent. Voltage regulation is an economic problem of great importance and distribution systems are designed upon the basis of maximum voltage drop. If the secondary drop could be increased even 2 per cent by changes in transformer reactance great savings would result and this procedure should be measured against the use of regulators and other methods used to improve regulation. This question is a very definite economic engineering problem to be considered at this time.

Controlling Kaplan Unit Having Dual Service

By JOHN FIES*
Dallas, Tex.

SITUATED out on the end of a 125-mile lightly loaded 60-kv. line in Texas, on the Llano River, is an unattended and fully automatic hydro plant with a Kaplan-turbine unit which operates either as a generator or synchronous condenser, with the generator output controlled by a paper chart† and condenser action controlled by system voltage. High efficiencies are obtained from one-quarter to full load, the unit being rated at 625 kva., 327 r.p.m.

Automatic control for Kaplan waterwheels is similar in many respects to that for Francis type units, but there are new problems. This is especially true with this unit of the Texas Power & Light Company because it must serve either as a condenser or generator. These problems and their solution constitute the principal point of this discussion, but to clarify it a brief summary of the starting and stopping operations is given first.

Summary of starting and stopping operations

Normal Generator Operation: Starting—An impulse to start operation as a generator causes, if protective devices permit, the following sequence: (1) The waterwheel governor opens the wicket gates quickly to a point where the hydraulic torque is sufficient to overcome starting friction; (2) the wicket gates continue to open, but are retarded by an escapement device on the governor so that the unit accelerates slow enough to permit the exciter to build up and to provide acceptable self-synchronizing conditions; (3) at approximately 95 per cent of synchronous speed, a speed switch closes, exciter voltage is checked and the machine-to-line circuit breaker closes; (4) the machine quickly synchronizes itself with the line by means of damper windings assisted by the regular acceleration of the unit; (5) excitation is immediately applied by a field contactor and voltage is established by a voltage regulator; (6) the machine takes load slowly until the acceleration control releases.

Stopping—When the impulse to operate as a generator is removed the following ensues: (1) The governor closes the wicket gates rapidly; (2) a large air valve opens just before the gates are entirely closed to admit air to break the draft in the wheel chamber. Since all other conditions are unchanged the machine is left on the line as a synchronous condenser with the turbine blades, which are now almost flat, spinning in air.

Restart—If a new impulse to operate as a generator occurs while the machine is operating as a condenser the governor immediately opens the gates and the generator takes load as the starting escapement device, previously mentioned, allows the gates to open.

Normal Condenser Operation: Starting—An impulse to start operation as a synchronous condenser causes, if protective devices permit: (1) The unit to start in the manner described for normal starting operation as a generator; (2) the wicket gates to close as soon as the machine-to-line breaker closes.

Stopping—When the impulse to operate as a condenser is removed: (1) The machine-to-line breaker opens, removing the unit from service; (2) brakes are applied to stop the rotation of the unit after it has had time to slow down; (3) the brakes are released after a short interval.

*Formerly design engineer, Texas Power & Light Company.
†ELECTRICAL WORLD, *September 23, 1933, page 396.*

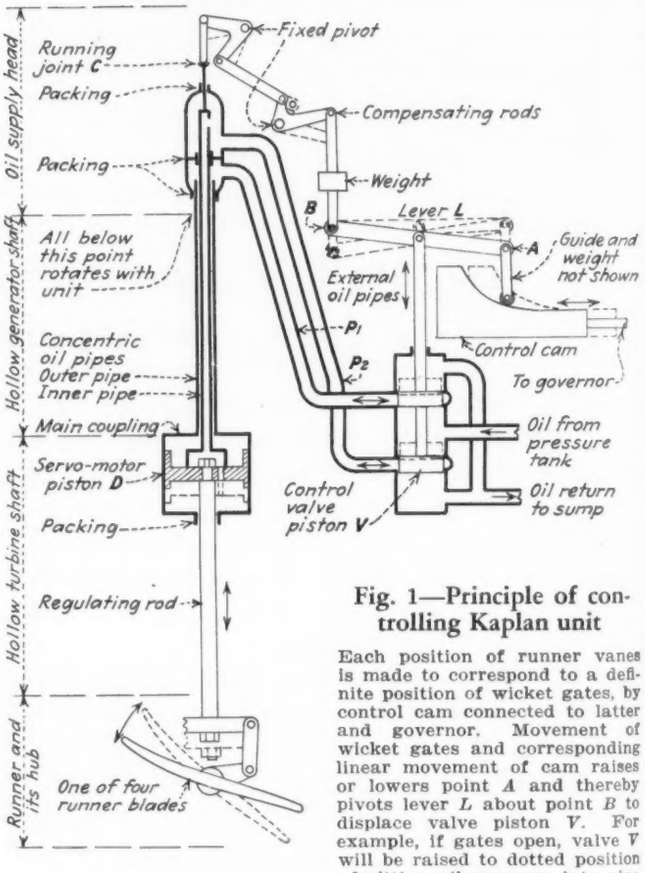


Fig. 1—Principle of controlling Kaplan unit

Each position of runner vanes is made to correspond to a definite position of wicket gates, by control cam connected to latter and governor. Movement of wicket gates and corresponding linear movement of cam raises or lowers point *A* and thereby pivots lever *L* about point *B* to displace valve piston *V*. For example, if gates open, valve *V* will be raised to dotted position admitting oil pressure into pipe P_1 and thence through outer concentric pipe to top of servo-motor piston *D*, which tilts blades. Oil from below piston passes through hole in piston to inner concentric pipe and thence through P_2 to return sump. As the inner concentric pipe is attached to and moves with piston *D*, the running joint at its upper end *C* and its slave point *B* of lever *L* moves correspondingly, returning valve *V* to its original position when the correct blade tilt is attained.

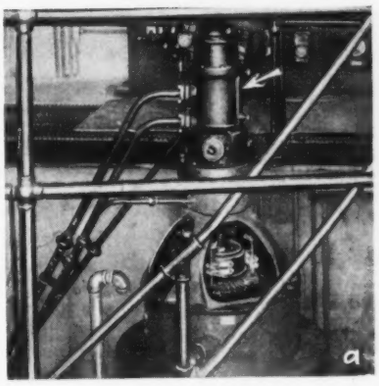
Irregular and Abnormal Operation.—The machine may be operated as a generator only. This operation is normal except that in stopping, the wicket gates in closing operate a governor position switch at about the no-load position to trip the machine-to-line circuit breaker and prevent condenser operation. The brakes operate as described.

The machine may be operated as a condenser only. This operation is normal as described before.

Problems peculiar to this application

Starting—The starting sequence was designed as if it were for a unit with a Francis type wheel. However, it was found in this case that the turbine blades are so flat at the normal starting point of gate opening that there is not sufficient torque developed to overcome starting friction. In cases where the machine had been shut down several hours it was necessary to open the gates an

amount which corresponded normally to light-load gate opening, in which case the machine after starting accelerated so rapidly that synchronizing was impossible. Since the starting sequence planned for this unit was standard both with respect to method and governor equipment, it was decided to increase the minimum tilt of the runner blades until good starting conditions were obtained with normal operation of the governor. The starting troubles were thereby eliminated, but as the blade angle must correspond with gate opening to obtain efficient operation the advantage of the Kaplan turbine was lost. This was remedied by providing a supplementary piece on top of the main control cam as shown at *A* in Fig. 3 to considerably increase the blade angle at the starting point, yet allow it to be at its correct value as indicated by the original cam at all points above the quarter-load position.



(a)—Oil supply head which admits oil to concentric pipes in hollow generator shaft to tilt blades. The upper part of the compensating mechanism is behind head. (b) Blade-tilt control valve showing control cam x and two control pipes and compensating rod running to oil supply head shown in (a). (c) Governor connected to gate control shaft (1), air valve (2) and rod (3) operating blade-tilt control cam.

Later it was found that for condenser operation the propeller windage losses could be reduced by decreasing the runner blade tilt at the closed-gate position and a new supplementary piece was provided similar to the first, but cut out as shown by the dotted lines in Fig. 3 below the designation A.

High Tailwater—It is necessary to provide positive protection against condenser operation when the tailwater level is high enough to touch the runner, because for condenser operation the blades are practically flat and the skii or lifting effect on the armature of the unit might prove disastrous.

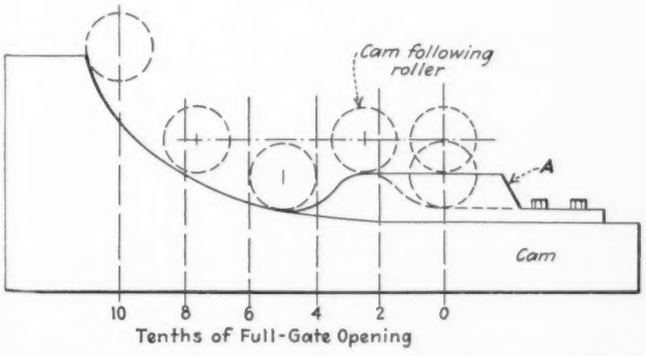


Fig. 3—How original blade-tilt control cam was modified

Attachment *A* was added to increase blade tilt at starting. The slot indicated by dash line minimizes blade tilt when unit operates as condenser. These changes were to expedite starting and reduce windage losses when floating on line.

Figs. 2 a, b and c—Parts involved in Kaplan turbine control

Air Valve—The point of operation of the air valve must be set very carefully, because if air is admitted to the wheel chamber at the starting point the starting torque may be decreased. If air is not admitted soon enough when the gates close for condenser operation, or if it is cut off too soon when the gates open on a restart from condenser operation, there may result quite a surge due to the drag of the water in the wheel chamber against the motor torque of the unit.

Restart—The opening of the wicket gates is retarded when the unit restarts as a generator from condenser operation the same as it is retarded during a normal starting operation. This causes, during restart, a period when there is water in the wheel chamber which exerts more drag than torque on the runner, and it is desirable to keep the starting time at a minimum. As the principal factor which determines the starting time is the rate which at the exciter builds up voltage, it was found advisable to provide a contactor to short circuit the exciter field rheostat until the exciter voltage was established and thus very materially shorten the starting time.

Excitation—Hydro-electric generators provided for operation as synchronous condensers must be designed for this service or protection must be provided against damage due to excessive excitation during condenser operation.

Oil Demulsified Electrically

Oil from repressured wells is very likely to be emulsified by inclusion of water to an extent far beyond the 0.5 per cent acceptable to pipe line companies and refineries. Experiments of the Illinois State Geological Survey (in Report of Investigation No. 29 by R. J. Piersol) have resulted in perfection of apparatus which demulsifies the oil in a continuous electrical process.

A 12-ft. length of 2-in. steel pipe passes the oil at a

rate of 30 to 60 gal. per hour. An electrode wire inside a glass tube extends the whole length inside the pipe and a high-voltage field coagulates the water globules and separates them from the oil. Eight minutes' exposure to the field increases the volume of a globule 125,000,000 times and two to four minutes usually suffices to clear the oil of the water. In the absence of a.c. service which can be stepped up by a "midget" high-potential transformer, an automotive storage battery and spark coil is equally effective. The steel pipe is grounded and the insulating glass tube prevents any explosive hazard. The action is entirely condensive.

Cove Lighting Effective in New Movie

By A. L. POWELL
Supervising Engineer, Incandescent Lamp Department, General Electric Company

In the Translux Theater, recently opened in New York City at 646 Madison Avenue, news reels and "shorts" are presented on a screen in a relatively bright room. The method of projection, the arrangement of the lighting equipment and the treatment of the walls and ceiling collectively contribute to the results and cheerful atmosphere produced.

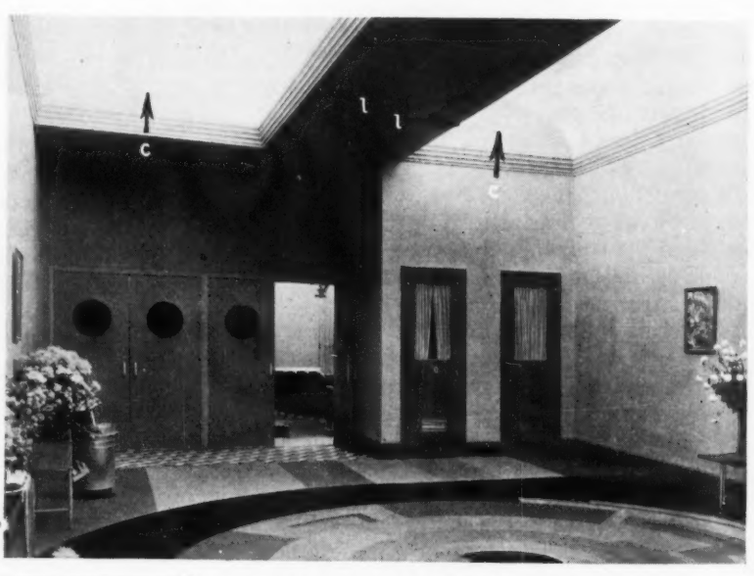
Projection is from the rear of a translucent screen. Miniature carbon reflector-type 25-amp. arcs are used. The area around the proscenium is covered with black velvet, while the remainder of the walls are covered with maroon moiré fabric with hangings of figured tapestry in dark red and gold. Circassian walnut pilasters and wainscoting and a dark maroon carpet with seats upholstered in dark blue-green complete the color scheme.

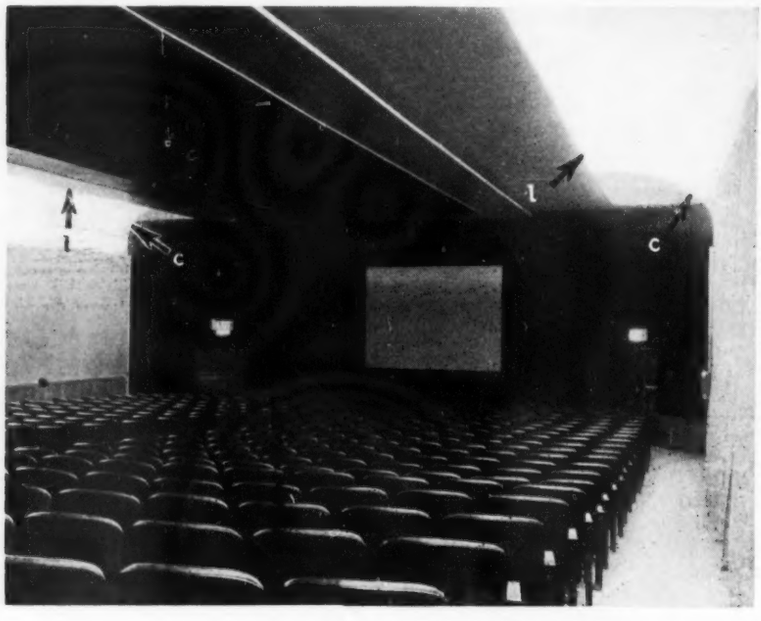
The central portion of the ceiling is flat and dropped about 3 ft. below the remainder of the ceiling, which is 17 ft. high. This central portion is painted medium blue, shading into blue-green around the border, and provided with aluminum striping. Along the sides of the auditorium, which measures 40x113 ft., the ceiling is in the form of a curved cove finished in medium yellowish buff.

Concealed along the edge of the hung ceiling is a continuous strip reflector, by the Frink Corporation, which extends from the rear to within approximately 15 ft. of the screen. Outlets are on 4-in. centers and 15-watt white and amber-orange "Mazda" lamps are used in alternate sockets. With both circuits at full brilliancy, the illumination level at the center of the auditorium is ½ foot-candle and at the sides 2 foot-candles. The lighting is dimmer controlled to any desired level.

The lobby, which is 25x50 ft., is likewise indirectly illuminated by a continuous strip reflector with 15-watt yellow, white and amber-orange lamps on 4-in. centers. This reflector is mounted along the edges of a longitudinal ceiling panel flanked by arch-shaped ceilings finished in cream color. Walls are done in a tan tone.

All sides, walls and ceiling have acoustical treatment and the theater is air conditioned. Lord Electric Company did the electrical work, Shapiro Brothers are responsible for the construction and Thomas W. Lamb was the architect.





Indirect illumination of auditorium and foyer

Strip lighting along edges "l" of drop ceiling is directed against coves "c."

N.E.M.A. Wants Price-Fixing Power

Proposals challenged by Johnson and Richberg in hearing for supplementary code.

Report on operations of electrical code to date

NEMA went to Washington to report to NRA on the operations of its code and ask for some amendments. The news came too late for adequate treatment last week. The association asked for authority to fix prices and was promptly challenged. At the opening of the hearing General Johnson made a brief statement in which he said that there has been a "great deal of criticism" of the electrical code. He assured the approximately 250 members of the industry present that all interested parties would be given full opportunity to be heard.

The Code of Fair Competition for the Electrical Manufacturing Industry was approved by the President on August 4, 1933; became effective on August 15, 1933, and designated the National Electrical Manufacturers Association as the code authority for the industry.

There now exist within the association 155 sections, groups and sub-groups, each dealing with its own specific product. The membership of the association has increased from approximately 300 companies in July, 1933, to approximately 600 at the present time, and these have formally designated a total of 1,225 of their employees to serve them in the association's activities.

The code provides for the grouping of aggregations of employers having common interest in product classifications for administrative purposes and the appointment of a supervisory agency for each. The 155 sections, groups and sub-groups have been so grouped in twenty product classifications. Supervisory agencies have been appointed and are operating in all but one, from which recommendation has not yet been received in accordance with a suggested procedure.

At its meeting on August 25 the board authorized a "code advisory committee," made up of five of its members, whose duty it is to consider and recommend on all matters of code interpretation and operation. Some 26 supplemental codes specific to individual products are in various states of completion and others are under consideration.

Labor provisions

Questionnaires were prepared, in co-operation with the Administration, covering labor adjustments by member companies and forwarded to a mailing list of 2,200 companies identified after extended effort as coming within the code. The advance sheets of the 1931 Census of Manufactures assign the total number of 1,389 companies (exclusive of radio) to the electrical manufacturing industry, with employment approximating 180,000. Data were collected from 871 plants, employing more than 179,000 wage earners, and have been filed with the Administration as required by the code, together with the number of companies which did not comply.

From such analysis as has so far been possible the following would appear to be established:

(a) Sixty per cent of the plants reporting are now paying their lower-rated employees at rates higher than in 1929. Forty-seven per cent are paying male employees at a minimum rate of 40 cents per hour or more. Of the plants that employ women 38 per cent are paying at minimum rates of 40 cents or more.

(b) Practically all of the reporting plants have raised their hourly wage rates for the lower grades of work as compared with their rates of May, 1933. Actually, 36,519 wage earners who were formerly being paid at less than 40 cents an hour are now being paid at 40 cents an hour or more.

(c) Male wage earners (other than learners) receiving less than 40 cents per hour are but 8 per cent of the total. Specifically such male employees number 9,795 out of a total of 118,234. As would be expected, the proportion of women employees receiving less than 40 cents per hour is greater; that is, 33,566 women out of 61,241 are receiving less than 40 cents per hour.

(d) Comparing data for 367 identical plants employing 85,543 wage earners, 191 plants had minimum rates in 1929 of less than 32 cents per hour. In June, 1933, the number of plants had increased to 256. In 1929, 80 plants paid minimum rates of 40 cents or over; in June, 1933, only 57; now no less than 150 plants pay 40 cents or over.

(e) Practically all plants have raised their hourly wage rates for the lower grades of work as compared with their rates of May, 1933. For work for which employees are now receiving 32 to 39 cents per hour, 25 per cent of the reporting plants have raised rates for males by more than 10 cents per hour. With respect to women employees now paid at rates of less than 40 cents per hour one-third of the plants reporting have raised their rates by more than 10 cents per hour.

(f) Learners, restricted by the code to 5 per cent of the total number of processing employees, are now actually but 3.4 per cent of such total number.

Incomplete analysis of the results of the first monthly report indicates that more than one-half of the plants reporting did not exceed code hours. The aggregate excess of the remainder amounted to 1.4 million man-hours, of which 1.2 million were for peak and seasonal demands and 0.2 million for emergency. The total time worked by those plants was 27.7 million man-hours. Thus in plants reporting any excess time whatever the excess hours were 5.5 per cent of the total hours worked.

Many divisions of the industry are subject to wide fluctuations in demand regularly recurrent at specific times in each year. Domestic refrigeration, radio and parts for home entertainment and Christmas goods are outstanding examples. The production rate of domestic electric refrigerators may vary 500 per cent between the period of light and heavy demand, and bulk prohibits warehousing to compensate. In others development, style considerations and public acceptance render advance manufacture extremely hazardous.

In consequence there may be non-concurrent wide

variations from month to month in specific industry branches—far wider because of non-concurrence than would be indicated by industry averages. The necessities of each branch can be determined only when time and facilities are available for detailed analysis for which these reports furnish the basis. This was the purpose of inclusion in the code of an elastic procedure rather than a fixed permissible excess.

Labor complaints

Complaints as to labor conditions received and considered by the association are of three general classes: (1) Those referred by the Administration and usually from individual workers; (2) those emanating from employers and indicating non-compliance of competitors; (3) those emanating either from employers or from workers' organizations and involving mass action in greater or less degree. The relative frequency is in the order named with the first class in major preponderance.

Considering the first class: Where the communications are not anonymous, inquiry so phrased as not to reveal the complainant is made on the manufacturer to obtain explanation of the conditions complained of. In practically all instances there has been frank and complete reply and, where complaint was justified, a remedying of conditions. In the large majority of instances, however, and as is expectable, individual complaint is based on misunderstanding of code provisions and the belief, born of the language of Clause 7 of the P.R.A. and its literal interpretation by local authorities, that despite shortened hours weekly wage payments would remain the same or be increased. In all such instances effort is made to set the true facts before the complainant.

Anonymous complaints are in general called to the attention of the interested employer, but no further treatment is usually possible. Where, however, there is enough recurrence of such complaint as to an individual manufacturer and enough of similarity to carry conviction that real cause exists, the case is followed carefully and if without result the entire correspondence is referred to the district compliance director for his handling.

There is no question N.E.M.A. believes that abuses and evasions exist, and that continuing co-operative effort by the industry and the Administration is essential to their removal, and is an element vital to the success of the entire NRA procedure. On the other hand, the actual handling of these complaints indicates that by far the major fraction of employers are striving honestly to comply both in letter and in spirit.

As to complaints of non-compliance lodged by competing employers, effort is made to determine by informal methods whether the complaints are sincere and reasonably justified or whether there exists an ulterior motive. Attempt is made by contact or correspondence to cure such as seem to have real basis, and if without real result all facts are brought to the attention of the appropriate district compliance director. It is recognized fully that these matters are definitely within his function until such time as the association embodies a neutral labor authority, and every effort is made to cooperate, aid and facilitate his efforts.

The handling of complaints emanating from employers or from workers' organizations has in general been confined to statement of the rights of each in the premises and has in but a single instance involved any investigation of the facts at issue. While there have been instances of important labor disturbance, the industry as a whole has been relatively so free as to indicate little necessity for setting up at this time the formal organization essential to the systematic handling of labor disputes. This is particularly the fact when there is realization of the complexity which such an organization must assume.

The code provides for the collection of general industry statistics. While the need for such statistics has long been realized, the complexity of the industry has militated against their collection. In consequence it becomes necessary to create the necessary plan and organization for such collection. All reasonable effort is being expended to this end, but the reports required by the code, the establishment of mailing lists, the preparation of questionnaires, etc., have absorbed in large measure the time of the rapidly expanding statistical staff.

No call has yet been issued for industry earnings statements and balance sheets. Since the fiscal year of most employers coincides with the calendar year, it is felt desirable to defer such call until the data are reasonably available.

A general formula for cost has been evolved and has been approved by the board of governors and circulated to the membership. Approximately 2,700 manufacturers in 65 industry branches have filed price lists and a definite and desirable stabilization has resulted. On the other hand, the purpose of the code is being in some measure defeated by those who seek methods by which the requirements may be evaded and chiseling perpetuated. It is believed that the experience gained includes most of the evasions most generally and effectively employed and that the section may be modified to meet them.

There is little, if any, indication that prices are being unreasonably increased, although some complaints are being received. In one instance an increase of 33⅓ per cent was brought forward. Investigation showed that the labor content in the product approximated 85 per cent of the cost and that in that industry branch the application of wage rates necessary to meet code figures had increased labor cost by some 40 per cent. A second instance, involving a much larger percentage increase, indicated that the prices upon which comparison was based were of March, 1933, the low ebb, and well below cost at that time. The present prices indicated no unreasonable profit in view of the advances in labor and material cost. The complaints thus far received have been so few in number as to permit individual investigation.

Price fixing sought

There are complaints in wide variety of non-compliance with fair trade provisions. It is felt that these are in large measure due to the activities of those seeking unfair advantage and who, because of the seeming lack of vigorous enforcement procedure, are led to believe that they are immune. It is believed that this evil will be diminished radically by comparatively few instances of actual prosecution and the association is actively cooperating with the compliance division to that end.

Francis E. Neagle, for N.E.M.A., presented a series of amendments and additions desired by the industry. The principal recommendation concerned price fixing and proposed that "the supervisory agency shall have the power on its own initiative or on the complaint of any employer to investigate any prices for any product . . . . and "if the supervisory agency after such investi-

gation shall determine that such price is an unfair price . . . . the supervisory agency may require the employer who filed the list or discount sheet in which an unfair price is shown to file a new list or discount sheet showing a fair price for such product . . ." and if the employer fails to comply within ten days "the supervisory agency shall have power to fix a fair price. . . ."

This proposal was challenged by General Johnson and Donald R. Richberg, general counsel for NRA. Mr. Neagle explained that the authority of the advisory agency was intended to apply only to unfairly low prices, and that there was no provision guarding against unfairly high prices. He said the industry had not been troubled in that respect, but he believed the code committee would be willing to make the provision apply equally to prices that were too high, if NRA desired.

Mr. Richberg then asked how a fair cost would be arrived at—whether it would be an "average cost," a "reasonable cost" or an "actual cost." Mr. Neagle replied that there were variable elements in the situation which were susceptible to abuse and this made it extremely difficult to determine a fair cost even under a uniform accounting system, and that what the supervisory agency would attempt to do was to fix a cost that would be fair and reasonable to the particular manufacturer being investigated.

The NRA general counsel asked if the administrative agency would take into consideration the question of whether a man had too many salesmen, spent too much on advertising, etc. Mr. Neagle replied that he could not say what would be in the minds of the men who would make up the supervisory agency, but his view was that they would study all pertinent factors and "exercise their best judgment."

Commenting on the "unlimited" power the provision would give the supervisory agency, Mr. Richberg asked Mr. Neagle if he knew of "any authority in law for the enforcement of such a provision." Mr. Neagle answered that he knew of no such authority in law "at the present time," to which Richberg rejoined: "I think I can agree with you."

General Johnson then took up the questioning, declaring that in the last analysis the proposed section meant "arbitrary price fixing on the products of an individual manufacturer by a jury of his competitors," and that there was nothing to prevent the supervisory agency from "considering the whole universe" in determining what it thought a fair price should be. Mr. Neagle conceded this was potentially possible, but argued that in the practical operation of the plan the supervisory agency would consider only those factors which legitimately entered into the cost of production.

C. L. Collens, president of the Reliance Electric & Engineering Company, Cleveland, proposed an amendment which would provide for the filing of resale price lists by manufacturers whose own sales representatives were active in either primary or secondary markets. The proposal evoked extended questioning by both General Johnson and Mr. Richberg, who expressed belief that the matter involved a rather difficult legal problem. General Johnson pointed out that retailers as well as wholesalers were bound by codes not to sell below their respective invoice costs and the discussion was closed by Mr. Richberg's remark that "this is getting us into the forbidden ground of price fixing."

Contending that the principle of competitive prices must be maintained "unless there is to be complete socialization of industry with the government setting prices," Willis B. Rice took the stand on behalf of the Independent Electric Lamp Manufacturers Association, an organization of 28 firms producing electric lamps and their accessories, but not operating under licenses from the General Electric Company.

Mr. Rice charged that the proposed price-fixing provisions were not justified by present needs, and that operations under patent laws had resulted in creating a monopoly for one "dominating" company which, he asserted, received more than 90 per cent of the entire lamp industry's profits. He urged adoption of a separate code for lamp producers, asserting, in response to a suggestion by Mr. Richberg regarding a supplemental code, that the provisions his group wanted to include in a code would not be of general application to the electrical manufacturing industry.

Philip D. Reed, of counsel for the General Electric Company, excepted vigorously to previous statements by Mr. Rice concerning the business volume and practices of his client. Mr. Reed asserted that total business of the General Electric Company for the last eleven months of 1933 was only 20 per cent of the combined volume transacted by members of the National Electrical Manufacturers Association, and that his company produced last year only 49 per cent of lamps manufactured, instead of the approximately 90 per cent previously stated by Mr. Rice. Under questioning by Mr. Richberg, the witness added that licensees of the General Electric Company had produced 25 per cent of the lamps manufactured, and that other American manufacturers were responsible for but 6 per cent of the total, with imports amounting to approximately 21 per cent.

"Better Light, Better Sight" in Chicago Bindery

"Although it is difficult, impossible in fact, to put a money value on the benefits from rehabilitation of the lighting in our plant," said E. H. Wolfe, vice-president of the Barrett Bindery Company, Chicago, Ill., "we are very certain that the approximately $1,500 we paid for wiring and new equipment is one of the best investments the company ever made. Also, our lighting bill is a little higher each month, but nowhere nearly in proportion to the increase in number of lighting units nor to the improvement in lighting conditions.

"We have always been proud of our plant, of the equipment in it and of the work we do, and up until about a year ago we would have included the plant lighting as well. Then Roy T. Hyre, the contractor who does our electrical work, called around with a light-intensity meter and showed us that the lighting was nothing at all to be proud of. We had had the idea that light on the work necessarily meant that the lighting unit itself had to be practically on the work as well. But Mr. Hyre changed our ideas and showed us that general illumination of a reasonably high intensity with the lighting units up high, close to the ceiling and out of the way, would be much better.

"Mr. Hyre also told us what an important factor white paint is in good lighting. So we told him to go ahead

with his electrical work while we repainted the walls and ceilings. On the two floors of our plant where production work is carried on he installed about 150 200-watt 'Glassteel' units, two diagonally placed in the 14- to 18-ft. square bays of the active production area. He took about 100 RLM fixtures from inactive parts of the plant and relocated them in the less active spaces of the two working floors. The result is that we are again proud of everything in our plant, including the lighting, and we know that it is paying its way if only in better working conditions for our employees, and we know that it costs less to keep the plant clean—a man hesitates to spray brown tobacco juice into a white corner that is lighted up so that every spot can be seen."

The Engineer and the New Deal

By DEXTER S. KIMBALL
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IT WAS inevitable that sooner or later the engineering profession would attempt to evaluate itself and demand the recognition that the public has already accorded to other learned professions. The wonder is that this has so long been delayed. Of course, there have been sporadic attempts to obtain this recognition and there has been much ill-advised talk on the part of engineers about their mission in reforming our political affairs, but as yet nothing very effectual has developed.

The reasons for this backwardness are several: First, the public has been slow to grant professional recognition to engineering because of its "shoppy" background and it has required such spectacular achievements as telegraphy, telephony, radio, television, etc., fully to convince this public that the engineering mentality is equal to, or even superior to, that of the older higher callings. Engineering is now fully established as a "learned profession." Second, the term "engineer" has been used so indiscriminately in connection with all manner of callings that it has lost its true significance and in some quarters is almost a term of reproach. This has resulted partly from the fact that engineering permeates every nook and corner of our existence. The work of the doctor or the lawyer enters our lives as an occasional matter and in a very specific manner, whereas all men are engineers to a certain extent. Lastly, there has been the general lack of coherence among engineers as indicated by the useless and weakening tendency to multiply engineering societies, many of which have no logical reasons for existence. For instance, there are no less than four societies in this country devoted to the problems of management. We have nothing approaching the American Bar Association or the American Medical Association, but rather we resemble the church split up into all manner of creeds and sects. We are a house divided against ourselves.

It required the economic pressure of this depression to furnish the motive power for a drive for better recognition of the engineering profession. The first result of this pressure was the organization of the Committee for Professional Development by the founder societies and affiliated groups, which apparently is making some progress and concerning which every engineer should inform himself. The second influence, I believe, is the NRA. I am quite well aware that engineers in general have an antipathy to regimentation and they tend to associate themselves with capital, rather than with labor. But undoubtedly if the NRA is to cover all industry we shall not be exempt. As I write I have before me a proposed code for engineering laboratories that engage in commercial testing and which probably will be approved and made legal. There is also under discussion a code for engineers engaged in "construction," whatever that may be, and we shall undoubtedly have many others if the NRA is continued.

In brief, the situation in the engineering profession is one of chaos, to say the least, in so far as any professional recognition is concerned. Even our licensing laws, which represent the most advanced effort to secure legal recognition of certain forms of engineering, leave much to be desired in scope and clearness. Two changes are necessary, I believe, before any clarity can be hoped for. The first is a radical *consolidation* of the multitudinous engineering societies in the United States into a few strong groups, each representing a major branch of the profession. Second, there should be a careful *classification* within each group so that the basis of professional recognition shall be clearly defined. Without such consolidation and classification I believe that neither codes nor licensing regulations can be effectively promulgated. And I am not very hopeful that the profession is ready as yet for such a radical departure from the policy of *laissez faire* that has so far governed most of our professional societies.

Testing Bushings and Insulation by Power-Factor Methods—II

By I. W. GROSS and H. E. TURNER
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Part I of this article* pictured the problem presented due to the failure of high-voltage oil circuit breaker and transformer bushings. It outlined the faults inherent in these types of bushings and in the insulation of their associated apparatus; it also described a practical field test set and its application in detecting and tracing down such faults in the field. Results of tests of some 4,000 oil circuit breaker bushings made in 1929 and of some 450 transformer bushings were presented and discussed. This article will give and discuss the results of tests made with the Doble insulation tester from 1931 to 1933 inclusive, on bushings and other high-voltage apparatus, such as transformers, coupling capacitors, bus supports, insulators, wood and oil.

AS A result of the costly experience due to the failure of oil circuit breaker bushings during the past few years it was decided to make a systematic test on practically all oil circuit breaker bushings operating at 22 kv. and above. The portable insulation tester which had to us proved its merit in 1929 and 1931 was adopted for the purpose and routine tests were started in May, 1932. It was planned to test these bushings (some 8,500 total) yearly, over a two-year period, or oftener if time permitted by the continuous use of one testing set. Where defective bushings were indicated by the tests, it was at first planned to trace down the trouble at the time of tests, to see if any generally bad conditions existed which might have to be corrected by a blanket change in maintenance procedure or otherwise. Further, this periodic testing plan would permit tracing the deterioration in all bushings from year to year, and any special group of bushings at shorter intervals throughout the year.

Both of these plans are being carried out, and in addition a second test set was secured about four months ago which allowed starting a similar test schedule on transformer bushings. The use of the two test sets now makes possible the routine testing of oil circuit breaker and transformer bushings as well as other miscellaneous high-voltage equipment such as bus insulators, wood insulation, coupling capacitors, oil and transformer windings, as well as the detailed investigation of faults found. The tests on the above equipment will be described.

From 1931 to December 1, 1933, approximately 10,000 bushings have been tested. These comprise some 9,000 initial service tests and 1,000 repeat tests to locate faults and check reserviced bushings. The condition of the bushings tested since the beginning of the systematic schedule started in 1932 is indicated in Table I. Bushings tested have been segregated as to type, and their faults classified using the yardstick of quality indicated in Table I in the previous article.

Table I—Power-Factor Tests on 7,637 Bushings

Bushings in Service 1932-1933

Type of Bushing	Oil Filled	Compound Filled	Cond.	Solid Porcelain	Totals and Per Cent
Number tested	4,210	2,344	936	146	7,636*
Marked "defective"	270	218	124	27	639
Marked "remove"	247	106	74	17	444
Per cent "defective"	6.4	9.3	13.2	18.5	8.4
Per cent "remove"	5.9	4.5	7.9	11.6	5.8
"Defective" conditions external to bushing					473
"Remove" conditions external to bushing					52

Spare Bushings

Number tested	334	302	102	2	740
Marked "defective"	14	19	15†	0	48
Marked "remove"	11	10	43†	0	64
Per cent "defective"	4.2	6.3	14.7†	0	6.5
Per cent "remove"	3.3	3.3	42.1†	0	5.7

* Not including some 800 bushings retested.

† All rather old bushings stored in position in oil circuit breaker which was not filled with oil.

It should be noted that defective bushings are not confined to any one particular type; the same is true of faults found in oil circuit breaker insulation, external to the bushing. The figures of 8.4 and 5.8 per cent of total bushings classed as defective and recommended for removal would probably be reduced somewhat if every case of trouble had been traced down at the time of test. Some of these cases might have definitely shown the trouble to be not in the bushing itself, but due, instead, to the surface condition of the bushing inside the tank or other conditions inside the tank impossible to remove without thoroughly overhauling the breaker.

The faults external to the bushing are due to defective oil, carbonized oil, moisture in the lift rods, guides, bracing or other internal insulation. In every case where faults indicated on test were traced down the fault was found practically as predicted from the initial test results. With this background established early in the testing work faults indicated on later tests were not always followed up at the time of test, but removal of the fault was left to the maintenance crew.

Although a high percentage of solid porcelain bushings were found with high power factors, it is believed the

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defects are of a character not necessarily making such bushings unsafe to operate. Deterioration of the wrapped stud was found in some cases which may result in troubles other than electrical breakdown in service. Additional tests are necessary on this type of bushing before generally condemning them for further service on the basis of power factor alone.

That more than 14 per cent of all bushings were found faulty in oil circuit breakers in regular operation and a nearly equal percentage (12.2) in the group of spare bushings is not a situation to take lightly. Further, about 15 per cent of the breakers showed internal faults in addition to the faults indicated in the bushings themselves. Since such a condition in high-voltage oil circuit breaker insulation might seem almost impossible on a system which is well maintained, it is of interest to present some of the typical cases of trouble found during and as a result of these tests.

Typical cases of faults

A 37-kv. oil-filled bushing which had been repaired by the manufacturer's service man in the field was found in service a year later to have a power factor of 14.7 per cent and 1.61 watts loss. Detailed analysis showed the oil in the bushing with a 25-kv. breakdown, but the oil power factor was 52.0 per cent. After cleaning the bushing and replacing the oil the power factor was 3.9 per cent and watts loss 0.19. While the power factor is still high, other factors, such as the watts loss and the short time intervening between testing and filling the bushing with new oil, indicate a satisfactory condition of the bushing.

Another 37-kv. oil-filled bushing found by test with 45.0 per cent power factor and 4.79 watts loss was dismantled and sludge and moisture found inside. The insulation at the bottom of the bushing was found soaked with water. A 24-hour heating of the insulation in hot oil reduced the power factor to 16.0 per cent and the watts loss to 0.84. The bushing was condemned for further service.

Another bushing showing 13.0 per cent power factor and 1.22 watts was disassembled and the inside insulating cylinders, tested with the testing set, showed from 14 to 76 megohms. Similar good insulating cylinders tested at the same time and in the same way gave 1,180 to 1,250 megohms. The 14-megohm section showed a dark brown color as though it had been burned. The inner insulating cylinder was removed and an attempt to dry it out was made. The net result was the bursting of the cylinder in several places. After the bushing had been reassembled with a new insulating cylinder it tested 2.6 per cent power factor and 0.11 watts; that is, the fault had been removed.

In another case where an external "removal" condition was indicated the wood cross bracing between the lower end of the bushings was found by the test set to have a resistance from 3.2 to 4.8 megohms. Good wood was found to have about 2,000 megohms resistance. The oil circuit breaker tank oil tested 15 kv. and had too low a dielectric value to test for power factor.

The bushings on a 132-kv. oil circuit breaker tested from 4.6 to 6.5 per cent power factor with 0.40 to 0.53 watts each. Investigation showed the oil from the different bushings to have a breakdown of 15 to 25 kv. and a power factor from 2.0 to 73 per cent. After the oil had been changed in all bushings they tested 2.7 to 4.3 per cent power factor, the highest reading being found in the tank, where the wood showed 400 to 500 megohms on the a.c. test set. Four months later this oil circuit breaker tested O.K., after being serviced as the result of the above tests.

In still another 132-kv. oil circuit breaker, bushing power factors were found ranging from 5.3 to 8.8 per cent. The bushing oil was changed and five months later the power factors ranged from 1.7 to 2.5 per cent, showing that the faulty condition had been removed.

Tests taken on some new bushings just received gave power factors of the oil from 2.6 to 5.4 per cent and on the bushings the dielectric strength of the oil tested from 17.5 to 25 kv. New oil tested at the same time showed 0.6 per cent power factor.

In a 37-kv. oil circuit breaker two bushings showed power factors of 4.5 and 5.2 per cent, with a defective condition marked for the tank carrying these two bushings. Investigation located bad wood in the cross bracing. This wood tested from 99 to 135 megohms, while new wood, at the same time, tested 2,200 megohms. After the defective wood had been replaced the bushings tested O.K. and the external fault did not reappear on test.

An alarming condition was found in a 25-kv. oil circuit breaker on a generator at one of the major power plants. One bushing had a power factor and watts loss too high to read and broke down at 25 kv. on 60-cycle test. Before tests this bushing meggered 1.7 megohms. Another bushing tested 8.4 per cent and 2.04 watts and failed at 31 kv. on 60-cycle test. Before test this bushing meggered 850. Finding and removing these two bushings before failure occurred undoubtedly prevented a certain shutdown of the plant.

In a 37-kv. breaker one bushing was found with a power factor of 19.5 per cent and 1.97 watts. The bushing inner insulation on examination was found with a power factor of 46 per cent and the conductor insulation with 100 per cent power factor. Similar good insulation should run about 2.5 per cent power factor. This bushing was given a flashover test and failed at 180 kv. at the bottom end of the bushing.

A 132-kv. breaker showed bushing power factors from 6.9 to 11.1 per cent and watts from 0.53 to 1.00. Investigation gave resistance values of the wood lift rod and guides ranging from 21 megohms up. Similar good wood out of the storeroom tested 1,500 megohms and upward. The wood was removed, baked 40 hours at 210 deg. F. and the resistance brought up to normal. After reinstalling this wood in the breaker and some other new parts the breaker tested O.K. Considerable time and care was given to checking and tracing the defects in the above wood insulation and the results showed conclusively that the defects indicated on test were real and could be removed.

That factory rebuilding of bushings does not always successfully reinsulate the bushing was brought out on one test of a bushing rebuilt at the factory two years previously. This bushing was subsequently found in service with a 16.1 per cent power factor and 1.65 watts loss and according to the manufacturer's own rating should be removed from service.

In the test of another breaker an indicated power factor on the bushing of 23.3 per cent was traced to a defective bus insulator which tested 53.5 per cent and 1.60 watts. A similar good insulator should test about 2.5 per cent and 0.10 watts.

On another breaker one bushing tested 15.6 per cent

Table II—Power-Factor Tests on Potential Transformers

1932-1933

P.F. = Per cent power factor. W = Watts loss.

Bushing No. 1		Bushing No. 2		Bushings Nos. 1 and 2 and Winding		Winding Alone	
P.F.	W	P.F.	W	P.F.	W	P.F.	W
2.7	0.10	9.8	0.40	5.0	1.32	4.3	0.93
13.4	0.65	12.1	0.52	9.8	2.85	7.7	1.73
7.1	0.30	9.7	0.46	6.4	1.81	5.0	1.11
22.0	1.32	12.1	0.56	9.2	2.86	4.8	1.09
3.5	0.14	3.8	0.15	4.5	1.26	5.5	1.24
3.0	0.13	2.8	0.12	5.0	1.45	6.2	1.40
10.6	0.51	8.8	0.39	6.5	1.90	...	....
1.9	0.10	1.8	0.09	5.1	1.31	...	....
1.8	0.09	2.1	0.11	5.7	1.70	...	...
2.0	0.10	2.0	0.10	4.1	1.24	...	....

Table III—Instrument Transformer Classification by Power-Factor and Watts Loss

Use watts loss to determine classification if the power factor exceeds the values indicated.

Power Factor Limit (%)	Watts Loss Limit (Watts)	Transformer Rating
0 - 3.5	1.00	"G" (Good)
3.5 - 6.0	1.75	"DC" (Defective Condition)
Above 6.0	Above 1.75	"RC" (Remove Condition)

Table IV—Power-Factor Tests on Coupling Capacitors

Type Capacitor	Kv. Rating	P.F. (Per Cent)	Watts Loss	Remarks
Cable	132	0.6	0.25	.....
Mica	132	2.5	1.04	.....
Cable	132	0.9	0.35	.....
Tank	132	0.5	0.21	.....
Mica	66	1.1	0.41	.....
Mica	66	5.1	2.03	Remove
Porcelain	132	3.0	0.69	.....
Porcelain	132	2.8	0.39	.....
Cable	132	1.0	0.38	.....
Cable	132	1.1	0.45	.....

Table V—Faulty Bushings Found by Field Power-Factor Tests Failed on 60-Cycle Test

Ref.	Rating Kv.	Type	P.F. (Per Cent)	Watts Loss	60-Cycle Kv. Breakdown	Remarks
352	37	OF	19.1	1.91	180	Failed
920	15	SI	19.0	2.39	12	Failed
411	25	SI	8.4	2.04	31	Failed in 40 seconds
411-A	25	SI	—Off Scale—		25	Failed in 0 seconds
205	66	Cond.	11.0	1.04	183	Punctured
204	66	Cond.	6.5	0.69	183	Punctured
A	44	Cond.	6.2	0.31	60	Punctured
B	44	Cond.	9.5	1.93	60	Punctured

and 1.26 watts. This trouble was traced to a cracked bushing porcelain which had not been picked out on physical inspection.

An interesting though unusual case of trouble was found in one breaker where all six bushings had been installed very recently. A bad condition external to the bushings was indicated in one tank. Moisture was found over the submerged ends of these bushings which was traced to their installation during damp weather and inadequate protection against moisture.

On one of the properties where 2,250 bushings of all types were tested 121 "defective" and 98 "remove" bushings were found by the power-factor test. In addition 128 faults external to the bushings were found. This particular property used the d.c. test method periodically to check its bushings, and when the power-factor test was made the d.c. test was also made. The d.c. test picked out about six defective bushings, but the power-factor test picked out 121 defective bushings and a total of 347 defective conditions.

The cases of trouble cited above are some of the most outstanding found on the routine tests, although many other faulty conditions of insulation, particularly in wood bracing, lift-rods, bushing oil and tank oil contamination were found. The faults in bushings having lower power factors and watts loss than indicated above were found in practically all cases which were traced down. The cause of the trouble thus was found, although the importance of these defects in the operation of bushings has not as yet been fully determined.

Other insulation tests with the insulation tester

During 1932 and 1933 tests were made on instrument transformers, coupling capacitors and bus insulators in addition to the bushing and oil circuit breaker tests already cited. About 100 potential and current transformers rated 22 kv. and up were tested, some including bushings and winding together and some with bushings segregated. Typical results are shown in Table II. A number of bad bushings were found, some of which are indicated in the table. In many cases it is possible to pronounce the condition of the entire transformer "good" by the results of a single over-all test. However, a considerable background of test data and experience must be built up before test results can be analyzed with the same degree of certainty that now exists in testing bushings and breakers. As a result of tests so far made on instrument transformers the classification given in Table III has been tentatively adopted in our work to determine the condition of the transformers.

Coupling capacitors used for communication service are an important link in a power system and should therefore receive the very best maintenance. The insulation tester offers a means of not only checking the condition of the capacitor but also of tracing its deterioration. Some 80 capacitors have been tested in the last year and a half. Only one was found with sufficiently high power factor to recommend removal. Here again a background must be established for definite classification of faults, although it should be pointed out that not one of the capacitors which showed low power factors and watts loss on test has failed in service. Table IV gives typical results on four different types of capacitors tested.

Some testing has been done with the insulation tester on bus supports in stations, but although the extent of the work has been limited, several bad insulators have been found. This method of test, as evidenced by our experience so far, offers great possibilities in testing switch and stack insulators in a station where stray fields limit the value of most other test methods for insulators now available.

A 60-cycle flashover test was made on a number of bushings found defective with the insulation tester. The results of typical cases are given in Table V. The eight bushings, having power factors from 6.2 per cent up, all broke down before flashover. These bushings included oil-filled, compound-filled and condenser types. While the breakdown voltage is in some cases considerably above A.I.E.E. test specifications for apparatus in each voltage rating, the fact that the bushings punctured instead of flashing over indicates that they were potential hazards if they had been left in service.

Oil condition in the past has been judged for the most

part, in maintaining apparatus, by the breakdown test. That this test gives only part of the story is evidenced not only by the experience already cited but also by the power-factor tests on oil in Table VI. This table shows that oil testing 25 kv. and above may have power factors as high as 16.8 per cent, and when high power factor oil is found in bushings the bushing invariably has a high power factor and high watts loss. Detecting bad oil by the power-factor method has located a number of cases of trouble in our experience, and where the power-factor test is made on oil more dependence is placed on the power factor than on the breakdown test.

Check and periodic repeat tests

Deterioration of bushings in service is a subject about which very little is really known today; such information as was avaliable had been obtained by experience based on bushing failures. Information secured in this way is unscientific, inaccurate, costly and often disastrous. In starting the 1932 testing schedule it was believed that periodic repeat tests ought to be of value in portraying the trend of bushing deterioration. Some such repeat tests have already been made.

Special check tests were made on a group of oil circuit breaker bushings and the results are shown on twelve of them in Table VII. This shows that these bushings, which were in first-class condition in 1931, had deteriorated so badly 1½ years later that four of twelve were recommended for removal and five were classified as defective.

The retest of oil circuit breaker bushings over the entire system, which was started about three months ago, brought to light (Table VIII) two bushings badly deteriorated since the tests 1½ years earlier. In another case where a new type of bushing was installed tests 1½ years later showed one of these bushings classed as "remove" and one as "defective."

These tests prove conclusively the importance of making rechecks on the condition of bushings if costly failures are to be avoided. A continuation of these tests over a period of years will permit not only a constant periodic check on the condition of all bushings but also judging the comparative performance of different type bushings and determining their characteristic depreciation curve.

Table VI—Power-Factor Tests on Oil

(Typical Cases—1932)

	Oil		Bushings	
Location	P.F. (Per Cent)	Kv. Flash-over	P.F. (Per Cent)	Remarks
Tr. tank	3.1	33	5.3	Bushing found "R"
Clean oil	0.2	33	....	From supply tank
Bushing	5.6	28	4.9	Bushing found "D"
Clean oil	0.4	33	....	From supply tank
Bushing	9.5	28	6.8	Bushing found "R"
Bushing	8.3	25	8.0	Bushing found "R"
Clean oil	0.5	....	....	From supply tank
Bushing	3.2	....	5.9	Bushing found "R"
Top O. C. B. tank	1.6	....	7.2	Carbon in oil
Bottom O. C. B. tank	1.5	....	7.2	Carbon in oil
Bushing	5.4	....	11.1	Bushing found "R"
Bushing	17.1	....	19.0	Bushing found "R"
Bushing	16.8	28	4.0	Bushing found "D"
O. C. B. tank	7.4	28	4.0	Oil heavy with carbon
Bushing	1.5	17.8	4.6	Bushing found "D"
Bushing	52.0	25	18.0	Bushing found "R"

"R" = Remove. "D" = Defective.

	Per Cent
Good new oil was found with a power factor of about	0.4
Satisfactory oil in service	0.7

Table VII—Special Power-Factor Test on 37-Kv. O.C.B. Bushings Over 1½-Year Period

	12/15/31		8/16/33		
Bushing	P.F. (Per Cent)	Watts Loss	P.F. (Per Cent)	Watts Loss	Remarks
A	1.9	0.15	4.0	0.33	Defective
B	1.5	0.12	3.8	0.31	Defective
C	1.5	0.12	5.0	0.41	Remove
D	1.4	0.11	4.3	0.35	Defective
E	1.5	0.12	3.7	0.30	Defective
F	1.2	0.11	16.4	1.46	Remove
G	2.5	0.22	5.2	0.43	Remove
H	1.6	0.14	5.4	0.45	Remove
I	1.7	0.14	3.1	0.25	.....
J	1.5	0.12	2.9	0.24	.....
K	1.3	0.11	3.4	0.28	.....
L	2.0	0.16	4.7	0.39	Defective

Table VIII—Repeat Power-Factor Test of 37-Kv. O.C.B. Bushings

1932-1933

	6/9/32		11/20/33		
Bushings	P.F. (Per Cent)	Watts Loss	P.F. (Per Cent)	Watts Loss	Remarks
A-1	2.7	0.25	2.3	0.21	.....
B-1	2.9	0.26	2.6	0.23	.....
C-1	3.1	0.27	2.2	0.20	.....
D-1	4.0	0.35	12.1	1.1	Remove
E-1	3.4	0.31	3.8	0.33	Defective
F-1	3.6	0.31	2.6	0.23	.....
G-1	2.4	0.21	2.2	0.20	.....
H-1	2.4	0.21	2.0	0.18	.....
I-1	2.6	0.22	2.2	0.20	.....
J-1	*2.7	0.24	2.2	0.20	.....
K-1	2.6	0.21	2.2	0.19	.....
L-1	2.4	0.21	29.0	3.04	Remove

* This bushing found defective April 5, 1933, and replaced by another bushing.

During the first periodic tests of oil circuit breaker bushings some of the faults detected were not thoroughly investigated at the time, but left for the maintenance men to clean up later. Power-factor tests made later, after the clean-up, showed the bushings and breaker in nearly every case to be in first-class condition. That faults could be found with this power-factor method of test, recommendations made for removing the fault, and the fault removed, speak volumes for the test set, the analysis of results and the quality of servicing.

Some breakers were found in service two years without servicing, with conditions far better than on other breakers which had been serviced six months or so previously. Breakers which had been converted to high-speed operation showed better conditions than similar breakers of the older type. The possibilities of using the power-factor results as a basis for a more logical and economical maintenance program on bushings should not be overlooked.

Effect of temperature on bushing power factor

While the accuracy of the insulation tester is adequate for the use described above, there are other factors besides accuracy which should be taken into account in analyzing the data. It was early recognized that temperature and other atmospheric conditions had an effect on the test data. The effect of temperature on power-factor values of bushings, while generally understood, had not been reduced to a quantitative basis. To investigate this effect different types of bushings were given a temperature test in a controlled atmosphere in the laboratory.

The results of these tests are given in Fig. 1 for three types of bushings. These power factors have been converted into correction factor curves so the results on a

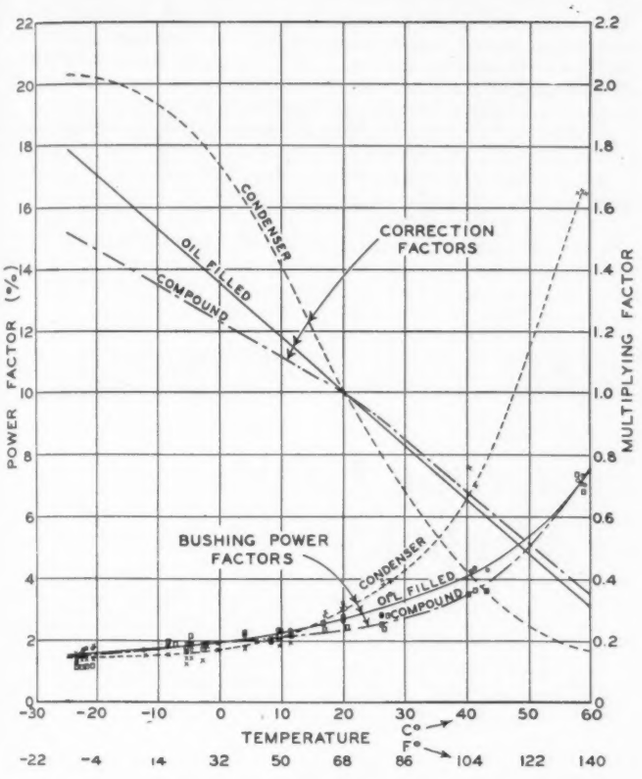


Fig. 1—Power factor-temperature characteristics of bushings

These are results of laboratory tests under controlled temperature. The correction curves to reduce bushing power factors to 20 deg. C. have been calculated from the individual bushing power factor curves shown.

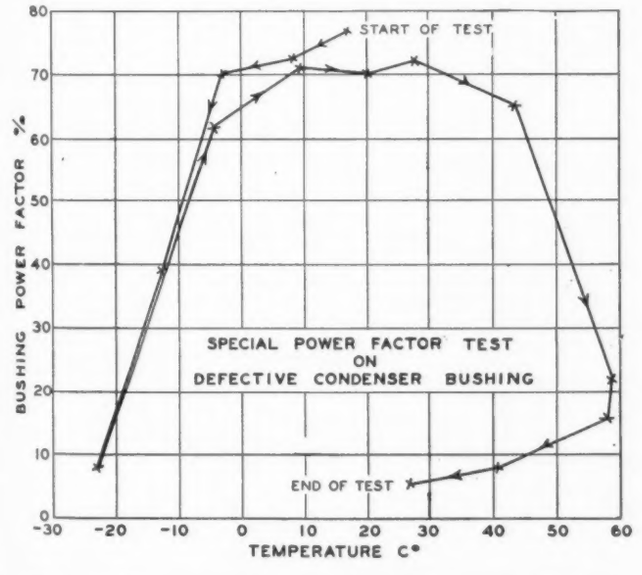


Fig. 2—Power factor-temperature characteristics of a very bad bushing

Initially had a 77 per cent power factor at room temperature. The temperature was varied from —23 deg. C. to 59 deg. C. After being partially dried out (5.5 per cent power factor) it failed on 60-cycle flashover test. Since this temperature test ran continuously for about five days, it appears the rejuvenation of a very bad bushing by applying heat alone for any reasonable time is only partial.

bushing tested at any practical temperature can be referred to a 20 deg. C. reference. While this information was not available at the time all the tests recorded in this paper were made, these corrections are now being taken into account in interpreting power-factor data.

The power-factor temperature characteristic of a bushing found very bad on the field test is shown in Fig. 2. This bushing had a power factor of 77 per cent at room temperature. As the temperature was lowered to —23 deg. C. the power factor dropped to 8 per cent, rising again to about 70 per cent at room temperature, dropping again as the temperature rose, and finally dropping to 5.5 per cent when the bushing cooled to room temperature. This bushing later punctured on 60-cycle test.

It should be remembered, however, that a bushing probably never has a constant temperature throughout its entire structure, so that these correction factors should be applied with intelligence and caution. Considerably more experience will be required in the use of correction factors applied to bushing power-factor readings before the corrected data can be considered fully trustworthy.

Bushing failures since tests

Since the periodic tests were started, in 1932, seven bushings of the group tested failed in service. Two of these had been recommended for removal, but had not been changed; two tested defective on the first routine test; one had been found very bad, reserviced and put back in operation without a power-factor recheck, and two were of a type which was known to give trouble without the least warning. These results show a bushing failure record of approximately 0.1 of 1 per cent since the tests. The failures took place within a period of fifteen months after the tests had been made. Had the bushings recommended for removal actually been removed, the failures would have been 0.05 per cent, of which half occurred in the defective group. This record on some 8,000 bushings tested leaves no doubt as to the benefits derived from these tests, although accurate results are not available for comparison with past years.

Apart from the effectiveness of this power-factor method of testing bushings, the number and character of defects found and their effect on bushing performance in service, a number of other important factors appear from an analysis of the results. One of these is the importance of oil circuit breaker maintenance. Without going into details, it was quite evident that the number of insulation defects found were very much less where the inspection and servicing were carefully, frequently and systematically done. This applies not only to conditions on different systems but also to different parts of the same system, where the justification for the best-grade maintenance is not the same.

It was repeatedly found that where bad insulation conditions were found in a breaker and bushings many of the faulty conditions were removed, as proved by test, after a thorough reservicing of the equipment. In some cases, however, some of the trouble still remained after servicing, so it is apparent that high-grade servicing of breakers and bushings will not always remove all faults, although it is an aid. Continual checking and rechecking are required to keep equipment in first-class condition.

The power-factor tests also showed up in some types of faults which the maintenance crew had no idea existed. For example, in one case a carbon deposit was found inside the arc shield of a bushing just after the breaker

had been completely overhauled. In the past the field maintenance crew had no satisfactory way of checking the internal insulation of bushings.

Before adopting the regular testing schedule on oil circuit breakers in 1932 the economics of the situation were studied. Based on probable bushing failures, as a result of experience and the 1929 tests, it was estimated the savings by adopting a bushing testing program would be about four times the cost of the testing on the American Gas & Electric Company system. This excluded the cost of the regular maintenance crew in the field (which would have been continued in any event) and likewise excluded the cost or value of interruption to service, loss of good will and other intangible factors.

The results of more than 1½ years' regular testing of bushings has not materially altered our original estimate; if anything, our estimated savings were probably low. As a result of this 1½ years' testing, and the defects found, we, as well as the men in the field, are so convinced of the value of these periodic power-factor tests that the second test set, as already mentioned, has been put into active service and a start made to test transformer bushings on the same schedule as oil circuit breaker bushings.

Summary and conclusions

The results of our pioneer testing of oil circuit breaker bushings in 1929 with the power-factor tester and the subsequent use of this set in testing bushings and other associated apparatus up to the present time have caused us to form some very clearly defined opinions on this subject. Only a very small part of the detailed testing work has been covered in this article, but test and other data are available to support the following statements:

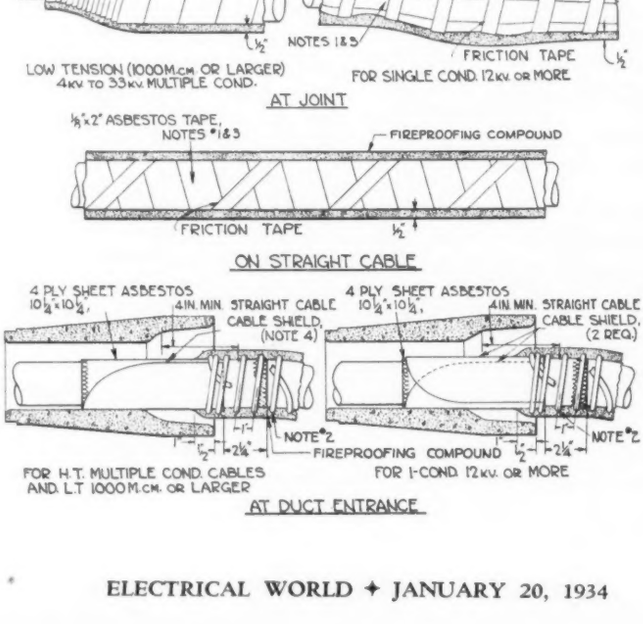
1. The power-factor and energy loss test method developed by the Doble Company is a reliable, effective means for determining faults in bushings, oil circuit breakers and similar high-voltage apparatus.
2. The test set developed is well adapted to the requirements of field testing.
3. The d.c. test method, as usually used, picks only the very bad faults, and then frequently fails to show that bushings which have actually failed in service are defective. The frequent use of the d.c. method, however, should not be discouraged, since if it is used merely as an additional test between periodic tests by the power-factor method some bushings which have actually "gone bad" between power-factor tests can be found.
4. While there is no test which will guarantee that a bushing once tested will not fail at a later date, it is believed that periodic tests by the power-factor method at reasonably frequent intervals will reduce bushing failures to a negligible number.
5. Careful and intelligent use of the test set and a similar study and interpretation of the test data are essential to obtain the best results of which this method is capable.
6. Faults found in bushings and oil circuit breakers show that while careful maintenance reduces the number of faulty conditions detected in service, even then some faulty conditions still escape and are hidden from the scrutiny of the maintenance men, The power-factor test will locate these faults.
7. Tests so far made indicate a yearly test on bushings, etc., may be desirable to maintain the equipment in the best operating condition. More frequent testing does not seem to be necessary, and the testing schedule perhaps may be lengthened without running an undue risk.
8. Our estimates on the cost of this testing work indicate that the savings effected by finding, renovating and replacing defective bushings before failures occur are conservatively at least three times the initial cost of the testing.

The results obtained have shown so conclusively that defective insulation can be found and the cause determined that we are extending our test schedule to include instrument and power transformers.

Protecting Cables in Manholes

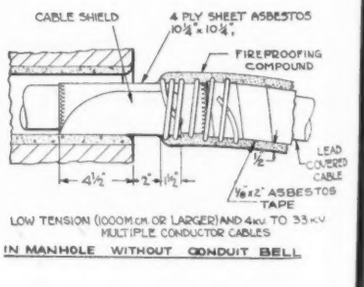
Considerable advance has been made in the protection of underground cables where they pass through manholes. This has been partly accomplished by systematic design of training and support of cables as they are installed so that proper bend radii are maintained and proper space is left for subsequent cables. Improvements have also been developed to protect cables at the duct entrance from injury as the cable moves in the duct with temperature change, and to protect cable from faults in adjacent cables where they pass through the manhole.

Details of one method of accomplishing this, used by the Commonwealth Edison Company, are shown. The cables at the duct entrance are protected by zinc shields which move with the cable and protect the lead from wear. The cables in the manhole are protected against spread of fire from outside sources by a layer of asbestos tape and a coating of fireproofing compound made of cement and asbestos.



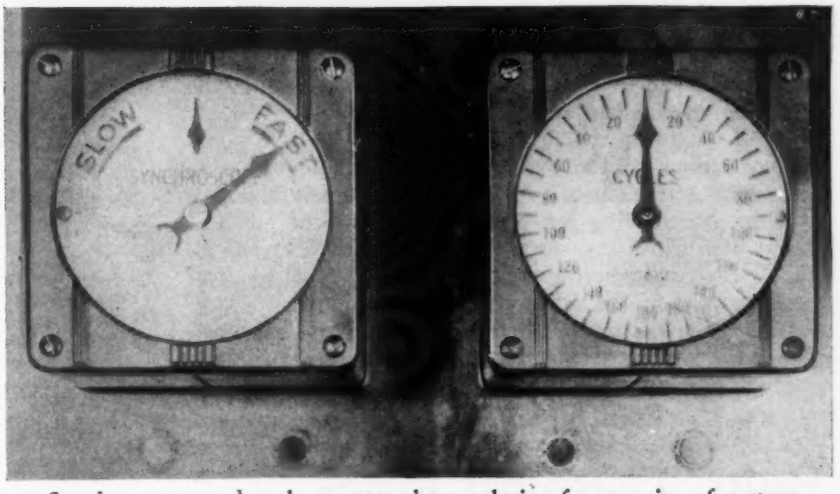
Method of fireproofing cable and protecting at duct mouth

Notes: (1) Apply the asbestos tape butt jointed lengthwise over the joint and spirally over cable; bind with friction tape. (2) Anchor the shield with six turns of ¼-in. rope. (3) Moisten asbestos tape before applying fireproofing compound. (4) Where cables are trained above ducts use two cable shields if diameter is 2¼ in. or more; on small cable use one shield wrapped around cable and lapped over on top.



Frequency and Time Control Aided by Telephone Company

By H. C. FORBES*
and F. ZOGBAUM†
New York Edison Company



Synchroscope and cycle-counter show relative frequencies of system and frequency-standard and cumulative departure in cycles

THE time-honored practice of controlling frequency at one station on a system is rapidly becoming inadequate due to the continual expansion of individual electric service systems and interconnection with others. At the same time the phenomenal growth in use of synchronous electric clocks has created a demand for closer frequency regulation than might otherwise be required.

When the 132-kv. tie was established between the Niagara Hudson system and that in New York City the control of frequency and time for the combined systems was delegated to Hell Gate station and the control of load on the interconnecting line assigned to the Niagara Hudson system. Although this arrangement was moderately satisfactory, it was found impossible to avoid substantial load swings on the interconnection and these fluctuations, added to those normally experienced from other causes, resulted in load variations at Hell Gate which were detrimental to operating economy.

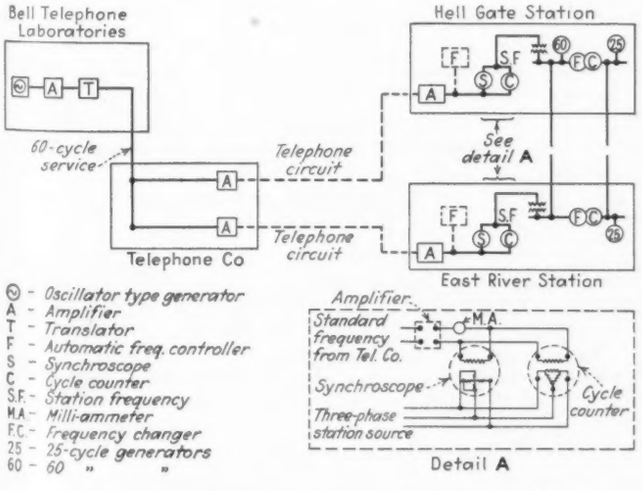
With a view to distributing the load fluctuations over a greater amount of generating capacity and improving the control of system frequency and time, an arrangement was made with the New York Telephone Company to deliver a 60-cycle frequency to the Hell Gate and East River stations for use as a reference standard. The source of this standard frequency is a quartz-crystal oscillator at the Bell Telephone Laboratories, which generates a frequency of 100,000 cycles per second with a stability of considerably better than one part in a million. By several stages this frequency is stepped down to 60 cycles, which is transmitted over a communication circuit. At the laboratories the elapsed cycles are checked against Arlington time by a cycle-adding and-subtracting device.

At Hell Gate and East River stations, where the 60-cycle standard is received, it is amplified and connected to one side of a standard synchroscope, the other side of which is energized from the power system. Thus the direction of rotation of the synchronoscope indicates whether the system frequency is low or high with respect to the standard frequency. Supplementing these synchroscopes there is similarly connected in both stations a special synchroscope having a revolution counter (developed by the Westinghouse company) which indicates the number of cycles the system has gained or lost with respect to the standard.

As a result of the availability of identical standards of reference at the two stations they are able to co-operate in controlling frequency without the usual difficulties encountered with separate standards that may not agree. With the latter, one station will attempt to increase frequency and another decrease it with very detrimental results from load swings on stations and tie lines.

Under the present operating procedure Hell Gate station is assigned the duty of correcting all cumulative errors in system frequency of less than 10 cycles gained

*System engineer. †Inside plant engineer.



Identical frequency standards made available to generating stations by telephone company

or lost. When the departure is greater, East River operators assist in the correction. Although the frequency is at present controlled manually, consideration is being given to automatic control.

As interconnected networks become more extensive and complicated, the authors believe the general availability of identical standards of reference will be of value in solving the problem of frequency control. It is understood that the telephone companies are giving consideration to the possibility of maintaining the same relative phase position for the standard frequency at all points of delivery. If this is found feasible and not too costly, possibly semi-automatic control of load as well as frequency can be applied at any generating station. This might be accomplished by actuating the automatic mechanism from a set of manually adjustable contacts so arranged that the generating potential would be maintained on the average at a given angular displacement with respect to the reference potential. Advancing or retarding the phase position of the contacts would then cause the station to increase or decrease its load. A corresponding decrease or increase of load would appear at the other regulating stations.

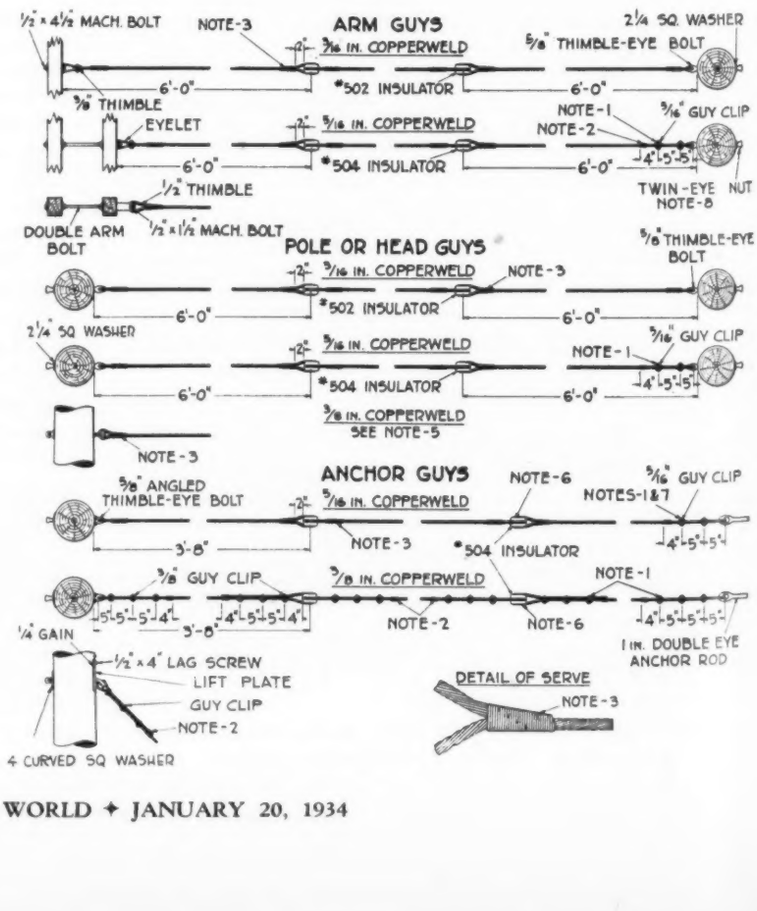
It is believed that some such system of combined automatic control of frequency and load represents the ultimate objective.

Bolts Through Poles Favored for Guys

When attaching a guy wire at a pole it has generally been the practice to wrap it twice around the pole, protecting the pole, if necessary, with steel plates and ending the guy wire by means of serves or clamps. Considerable saving and a much more satisfactory installation can be obtained, according to W. G. Kelley, plant design engineer Commonwealth Edison Company, by terminating the guy in a thimble-eye bolt run directly through the pole and equipped with a large washer to give ample bearing surface. The saving comes chiefly from the reduction in installation time, the elimination of the extra length of guy wire wrapped around the pole and the omission of steel-protecting plates. This type of installation does not weaken the outer fibers of the pole, which contribute most of its strength, and is not so liable to become slack after installation as sometimes happens with the general type of attachment when the wrappings around the pole compress the fibers.

Installation of guys using guy bolts

Notes: (1) Install outer clip first and screw it up tightly; apply some stress to guy before tightening other clips. (2) Make ten wraps around guy with one strand from end of cable. (3) Make four wraps around guy with each strand. (4) Paint all serving with weatherproofing compound. (5) For ⅜-in. head guy install insulators as in ⅞-in. head guy and clips as in ⅜-in. anchor guy. (6) Install this insulator not less than 8 ft. nor more than 10 ft. above ground. (7) On joint anchors, where difficult to install guy clips at the lower end of the anchor guy, these clips may be installed at lower insulator. (8) A standard nut shall be used where no guy is to be attached.



Less Energy for Traction in Depression Years

One-tenth of the energy generated in public utility plants in the United States is used for traction. The major part of this is used by street and interurban railways; about one-eighth goes into the operation of electrified divisions of railroads.

Disposition of Energy for Traction

Millions of Kw.-Hr.

Generated for Own Use

Disposition	1929	1930	1931	1932	1933
By electric railways		2,577	2,107	2,442	....
By electrified railroads		699	711	553	....

Generated by Electric Light and Power Companies

Used by railway departments	1,279	1,184	970	843	720
Sold to electric railways	5,049	4,997	4,549	4,175	3,980
Sold to electrified railroads	590	591	626	540	660
Total		10,048	8,953	8,553	

Statistics are available for only a few years, all in the depression period. They show a downward trend.

Beginning with 1930 the U. S. Geological Survey has reported separately the energy annually generated directly for electric traction. Figures for 1933 have not yet been announced.

Of the output of light and power company plants a portion is used by affiliated railway departments. In addition energy is sold to other companies for electric transportation. Quantities for 1933 in the accompanying table are partly estimated and subject to revision.

T.V.A. Effects a Deal With Southern Utilities

Whereas power companies, all of which are subsidiaries of Commonwealth (and Southern) Company and (Tennessee Valley) Authority, for the mutual benefit of the respective power systems of (the) power companies and Authority, desire to enter into an agreement . . .

SO BEGINS the momentous contract entered into January 4, 1934, by the three southern units of Commonwealth & Southern Corporation and T.V.A. for transfer of properties, for interchange of power and for the co-ordinated development of the T.V.A. load area. Territories adjacent to Muscle Shoals and the Norris Dam at Cove Creek are taken over wholly or partially by T.V.A. purchase. The authority binds itself, with certain limitations, not to engage in competition. Power interchange will be under a rate that starts at 3.6 mills for the first 300,000 kw.-hr. per quarter and reaches the very low unit figure of 1.08 milis for excess over 43,000,000 kw.-hr. per quarter. The contract lasts until December 31, 1938, or until three months after completion of Norris Dam, whichever is the earlier date.

In Mississippi the authority takes over all transmission and distribution lines, substations, generating plants and other property (except one dam site) in the nine counties in the northeastern corner of the state. The transfer is immediate and the payment agreed upon as $850,000. It embraces the following:

Merchandise and supplies located in eighteen towns.
Four small generating plants (including Tupelo's 4,375 kva.) totalling 6,825 kva.
Eight trucks (six ½-ton, one 1½-ton, one 6-ton).
Furniture, fixtures and tools in nine towns.
City distribution and rural systems in 31 towns and cities.
Eleven rural extension lines.
Thirteen transmission-distribution lines as follows:
66.4 miles of 44 kv.
45.5 miles of 22 kv.
115.9 miles of 13.2 kv.
Fourteen substations embracing:
Six 44 kv. with total capacity of 8,000 kva.
Four 22 kv. with total capacity of 712 kva.
Four 13 kv. with total capacity of 1,237 kva.

In Alabama the acquisition is not all immediate, but will take place from time to time as desired by T.V.A. It involves seven counties (all of five and parts of two) in northwestern Alabama adjacent to those involved in Mississippi and also includes the Muscle Shoals area. Transmission lines (44 kv. or lower), substations and all rural lines and rural distribution systems are stipulated. When all of these properties are taken the sum of $1,000,000 will be paid. Reproduction prices have been established for each item and T.V.A. is paying slightly over 60 per cent of these prices upon delivery.

A sum of $113,000 is set down as the replacement value of the 110/44-kv. substation at Nitrate plant No. 2. It has three 4,500-kva. transformers and a 20,000-kva. regulator. For the Decatur 110/44-kv. station a figure of $135,000 is set down to cover three 2,500-kva. transformers and two 46-kv. breakers. At Wilson Dam $1,750 is included to cover certain insulators and conductors. There are eight 44-kv. transmission lines valued at $545,026. They total 121.4 miles and in some cases the rights-of-way are retained by the Alabama Power Company for purposes of lines not transferred.

In the area are 21 substations (all but one, a 22-kv., are 44 kv.) and these are valued at a total of $385,763. Land is included in all but one case. Approximately 30,000 kw. of transformer equipment is represented, along with all buses, switching, regulators, meters, panels, etc.

The rural distribution systems conveyed to T.V.A. are valued at $481,295. The urban systems in eleven communities which are *not* transferred to T.V.A. are valued at $1,516,284.

All the real property, including 1,643 acres of land at the Joe Wheeler Dam site, are conveyed to T.V.A. at a price of $150,000. This amounts to about 51.8 per cent of the $289,505 price set by Alabama Power Company.

Tennessee properties acquired

Likewise in the northeastern part of Tennessee around Norris Dam Tennessee Electric Power Company will, from time to time as requested, transfer to T.V.A. all its lines, stations and distribution system in four and part of a fifth county. Along with this goes the 66-kv. line from Cove Creek to Knoxville in an adjacent county. For this aggregate the authority promises to pay $900,000, which is slightly less than 66 per cent of the $1,365,353 replacement value set upon these properties by the company. It carries trucks, land, distribution substations at mills, customer services and meters, office furniture, etc., as well as the lines and general distribution substations. Just as in the Mississippi and Alabama transactions the franchises, contracts and customers are to be turned over to T.V.A.

Further than this, the Alabama and Tennessee companies commit themselves to sell their urban distribution systems in the seven counties to the eleven communities at prices to be agreed upon and to use diligence in effecting the agreements. After three months' delay of negotiations T.V.A. can serve these communities itself, but promises to use its best efforts to bring about the purchases at fair prices.

Competition to be restricted

During the period of the contract none of the power companies will sell energy to any one—municipality, corporation or individual—in any portion of the counties enumerated. Nor will the authority sell energy outside these counties wherever the companies are rendering service. Nor will the authority sell energy outside these counties to customers of non-utilities supplied by the power companies. To this latter commitment there are several "provideds" as follows:

1. Authority can sell to municipalities not now served.
2. Distribution systems having interchange contracts with power companies shall not be considered as being supplied by the power companies, except that T.V.A. shall not have the right to interchange power with any utility operating under such interchange contracts.
3. Authority may sell to rural consumers in adjacent counties where not now served by the Mississippi and Tennessee companies.

4. T.V.A. may serve its own fertilizer plants or its other industries regardless of where they may be situated.

5. T.V.A. may sell up to 2,500 kw. of demand to customers anywhere, regardless of location, provided they are not at the time being served by the companies.

Companies to get surplus T.V.A. hydro

All surplus hydro power of the T.V.A. is placed at the disposal of the power companies with 20,000 kw. guaranteed if the power companies want that much at any time. In addition, to effectuate a co-ordinated interchange of power, the authority is to supply its totalized net demand upon the power companies with 15 per cent added to cover line losses. The maximum amount which T.V.A. is entitled to demand at all points of interchange is 70,000 kva. There are to be three points where T.V.A. will supply power to the C. & S. systems, two at Wilson Dam and one near Tupelo, Miss., after the Tupelo-Wilson Dam line is built. There are seven points where the companies will supply T.V.A. from their lines. The "totalized net demand" means the aggregate one hour integrated demand of the authority reduced by the corresponding aggregate demand of the power companies, with losses added in both cases where power is not taken at the point of generation. If new connections and increases in line capacity are necessary to serve customers designated by T.V.A. the authority will pay for them. The power companies shall retain title to improvements so financed by T.V.A., but in case of subsequent purchase by T.V.A. the net increase in value of such improvement shall be deducted from the purchase price.

Cost of providing the interchange connections at Wilson Dam shall be borne equally by the two parties, but entirely by T.V.A. elsewhere. Cost of maintenance and operation at the interchange points shall be borne equally and compensation of joint operating employees shall be borne equally. "No such employee shall be continued in service if objected to by either party."

Whether the net energy be a "take" by the authority or the companies, the energy rate is stipulated as follows, with computations and payments on a quarterly basis. The group of power companies are to designate an agent to deal for them on a lumped basis:

Quarterly Kw.-Hr. Consumption	Block Rate Mills per Kw.-Hr.	Quarterly Kw.-Hr. Consumption	Block Rate Mills per Kw.-Hr.
First 300,000	3.6	Next 18,600,000	1.8
Next 600,000	2.7	Next 21,600,000	1.35
Next 2,100,000	2.25	Excess	1.08

The power companies must pay T.V.A. $16,200 per month to cover the reservation of 20,000 kw. of capacity and along with it the use of the 154-kv. line on the Wilson Dam reservation and the expense of switching and voltage regulation in paralleled operation.

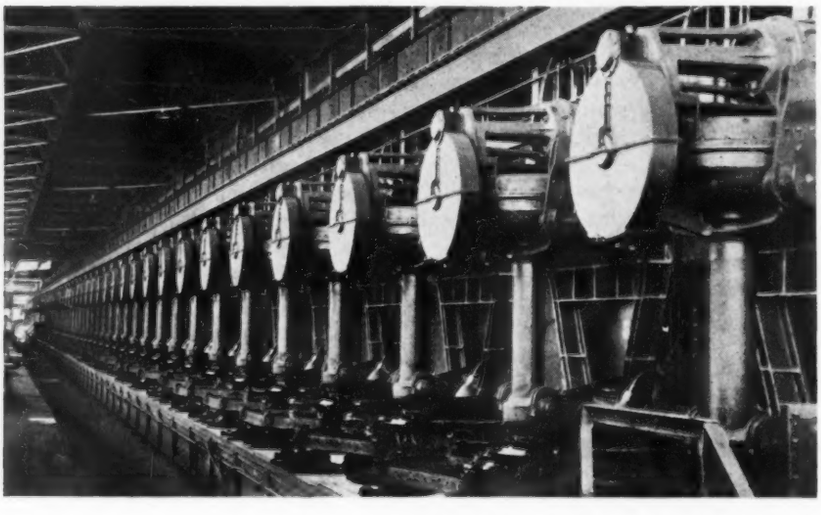
Rates in Tennessee to be reduced

Written into the contract is the promise of Tennessee Electric Power Company that it will at once file a new schedule of rates more or less comparable in level to those recently instituted by the other C. & S. companies in Georgia and Alabama. Two rates are stipulated. One is an "immediate rate" that starts at 6.5 cents for the first 25 kw.-hr. and gets down to 1.5 cents after two more blocks that represent 200 kw.-hr. The minimum bill is to be $1. The other is a "promotional" rate, as follows:

$1 per month including 15 kw.-hr. per month
4.5 cents per kw.-hr. for next 50 kw.-hr.
2 cents per kw.-hr. for next 135 kw.-hr.
1¼ cents per kw.-hr. for next 500 kw.-hr.
1 cent per kw.-hr. for over 700 kw.-hr.

Which of these two rates applies to any customer depends on his "base bill." For existing customers the base bill will be the charge (under the new "immediate" rate) for the same month of the year preceding the effective date of the new rates. For new customers and those of less than a year's standing the base bill will be the average for the first twelve months of use computed under the new immediate rate. The application of the rates is so to be made that no bill under the new "promotional" rate will be for less than the base bill and no bill under the new "immediate" rate will be rendered for an amount greater than the base bill. At the close of the first twelve months of the application of the new rates all base bills will be reduced 5 per cent. The resultant base bills will be reduced another 5 per cent at the end of 24 months. At the end of 36 months the new "immediate" rate will be eliminated and the new "promotional" rate will apply to every residence customer in the Tennessee district.

Finally, the four companies and the holding company agree to co-operate in the sale of electrical appliances throughout the entire territory served by them and to use their utmost endeavors to co-operate with T.V.A. and its Electric Home and Farm Authority, Inc., to promote the sale of electric appliances throughout the Tennessee Valley states served by them.



Grinding and Polishing Plate Glass

Here is an impressive installation of unit motor drives, and not small motors either. A continuous ribbon of plate glass passes under the 52 units in this line, of which 22 are grinders with 50-hp. motors and 30 are polishers with 75-hp. each. This is one of two identical grinding and polishing lines in the plant of the Pittsburgh Plate Glass Company at Crystal City, Mo. The two lines alone have a connected load of 6,700 hp.

Courtesy Union Electric Light & Power Company

Hotel Takes Combined Steam Heating-Electric Service

Features of cost analysis which preceded managerial decision to contract with utility.

AN EASTERN HOTEL fourteen stories high, with 604 sleeping rooms, a reputation for excellence of accommodation and a gross volume of 3,132,680 cu.ft. recently contracted with the local power company to supply it with steam heating and electric service for five years. Previous to the agreement the hotel had been operating its own boiler plant for steam supply, but had been purchasing electricity from the utility. Negotiations came to a head last spring as a result of proposals by a steam engine manufacturer to install an isolated plant of three 150-kw. engine-driven generators in the hotel and to take payment out of the alleged savings claimed from this procedure. The power company's engineering organization made an exhaustive study of the situation and of the engine company's proposals, and the hotel decided to continue to buy electricity and also to take steam service from the utility's lately developed underground supply system. The major points in the analysis by the power company follow:

The radiation surface in the hotel was 51,000 sq.ft., and the 1932 steam consumption was 38,169,000 lb. It was estimated that 26,700,000 lb. was required in space heating. Gross steam requirements per degree-day per 1,000 cu.ft. gross volume were 2.27 lb., and the heating steam per degree-day per 1,000 cu.ft. was 1.59 lb. The total heating service requirement was 5,368 degree-days and the demand per hour 11,000 lb.

A comparison with nineteen other hotels ranging in gross volume from 937,000 to 5,269,000 cu.ft. showed gross steam requirements per degree-day per 1,000 cu.ft. building volume ranging from 0.893 lb. to 3.22 lb. Fifteen of these hotels used more steam measured on the above basis, and it was brought out that if the hostelry in this case should take utility service complete, co-operating with the power company's engineers in seeking operating economies, the steam requirements of the house could reasonably be reduced by 25 per cent and the bill for steam service cut about 20 per cent.

Intangible benefits of utility service

It was pointed out that to achieve these economies it would be necessary to spend something for heat saving and control apparatus. In this case the utility offered to install the necessary apparatus at its own expense, partly because the hotel management was trying to put the house on its feet financially, and partly because a demonstration of the economies of the combined service would aid in obtaining similar business in other hotels in the company's territory. The operating force of the hotel was expected to do the maintenance work which the utilization study might show to be necessary, and this was agreed upon in the resulting contract.

Twelve major points were made by the power company in outlining the intangible advantages of central station service to this hotel, as follows:

1. With an isolated plant for generating electrical service the cost is fixed (except for the price of coal), while with utility service the hotel will benefit by any future rate reductions. (Example, the power company's rates were reduced last winter.)
2. Rental of boiler plant from February 6, 1933, was held up pending decision. If engines had been installed and utility service discontinued by October 6, 1933, the loss to the hotel would have been $4,000 (at $500 per month). (Note—The contract for combined electric and heating service was signed June 22, 1933.)
3. In the engine company contract the hotel is required to insure equipment during shipment from the factory to the user's place of business.
4. In the engine company contract the purchaser is required to maintain an opening for the installation or removal of equipment during the life of the contract.
5. The space in the hotel basement which would be used as an engine room if an isolated plant were installed has a dollar value to the hotel for a number of purposes. The coalbin also has some value. Some of the purposes for which this space might be used are: (a) Trunk storage as at present; (b) storage of articles other than trunks; (c) laundry if installed in the near future; (d) air-conditioning apparatus if required by the hotel business in the future. This is a distinct possibility.
6. With utility service the hotel will not be bothered by the city smoke inspectors.
7. Utility service will reduce the fire risk, cut down the boiler risk and eliminate the flywheel explosion hazard.
8. With utility service the traffic around the hotel in the nearby streets due to hauling coal, ashes and other power plant supplies will be eliminated.
9. The operation of the boiler plant in the hotel with the attendant smoke, cinders from the chimney and dirt from coal delivery and ashes removal will increase the operating expenses of the hotel for the following items: (a) Interior painting, papering and decorating (one hotel in the city estimates that this saving is $400 per month); (b) cleaning the outside of the hotel building; (c) cleaning of curtains, hangings, carpets and rugs in rooms and halls, and (d) cleaning the outside of windows.

   Note—A study made by three universities shows an estimated loss to a hotel ranging from $8,000 to $25,000 per year from smoke and soot.
10. The reliability of steam and electric service if supplied by the utility will be as nearly perfect as it is possible to obtain. With an isolated plant it will depend upon the performance of the installed equipment and the competence of the power plant operating personnel.
11. Utility service will reduce labor troubles. These can materially increase the cost of operating labor.
12. The management of the hostelry is in the hotel business with its personnel trained for that occupation. The work of generating steam and electric service is an entirely different business requiring a technically trained operating force and an entirely different financial structure. The power company has been in this business since its birth.

The problem of providing steam and electric service for the hotel was analyzed under five major schemes summarized in Table I.

These plans provided for cost estimates on the basis of (1) complete steam and electric service by the utility,

with supervision of the utilization of service by the power company's engineers; (2) the purchase of steam and electric service without utilization supervision, but with operation on the 1932 basis of hotel administration; (3) the generation of steam and electric service by the hotel, including the installation of engine-driven generators, figured on the basis of the first year's expense to the hotel; (4) the same plan, figured on the basis of the annual cost after the engines have been paid for, and (5) steam service generated and electricity purchased on the basis of the hotel's 1928 operations.

The lowest over-all cost to the hotel per year was computed at $47,897, plan No. 1. This employed the resources of the power company to the full for both steam and electric service and included the supervisory service of its steam heating specialists. The cost reflects the economies of operation believed by the power company to be within reach of the hotel in taking this full service. Plan No. 2, which was the scheme of purchasing steam and electric services without assured improvement of internal economies in the hotel system of heating and possibly of electrical distribution, ran up to a yearly cost of $58,690. The installation of an isolated plant and the operation of the present hotel boilers without purchase of energy or of any steam figured (plan No. 3) $71,833 for the first year, dropping to $55,296 a year after the engines have been paid for (plan No. 4), and in both cases substantially in excess of plan No. 1 The generation of steam in the hotel boiler plant and purchase of electricity on the 1928 basis figured $72,811 per year. The value of making use of the utility's full service was clearly set forth.

Table I—Summary of Schemes for Hotel Service

Cost Comparisons Exclude Cents

	I Steam and Electric Service Purchased with Utilization Work by Co.	II Steam and Electric Service Purchased: 1932 Cost	III Steam and Electric Service Generated: Present Boilers, Add Engines. First Year	IV Steam and Electric Service Generated: After Engines Are Paid For	V Steam Service Generated, Electric Service Purchased 1928 Figures
Fixed Charges: Interest taxes and depreciation or payment to engine manufacturer	$ 0	$ 0	$25,087	$8,550	$ 0
Fire insurance	0	0	192	192	0
Total fixed charges and fire insurance	**0**	**0**	**25,279**	**8,742**	**0**
Labor	8,320	8,320	19,240	19,240	22,776
Subsistence	540	540	1,080	1,080	1,140
Liability insurance	60	60	140	140	100
Total labor and liability insurance	8,920	8,920	20,460	20,460	24,016
Fuel at $5 per short ton	0		17,465	17,465	18,749
Ash removal	0		546	546	400
Water (additional)	0		748	748	500
Maintenance	0		1,638	1,638	500
Miscellaneous (supplies, etc.)	0		1,365	1,365	800
Boiler insurance	0		100	100	100
Operating costs, excluding overhead	8,920		42,322	42,322	45,065
Overhead, 10 per cent	892	892	4,232	4,232	4,506
Total operating costs	**9,812**	**9,812**	**46,554**	**46,554**	**49,571**
Utility steam service	23,701	29,649	0	0	0
Utility electric service (1932 use)*	19,789	24,113	0	0	23,239
Government tax 3 per cent	593	115	0	0	0
Gross cost of purchased service	44,085	53,878	0	0	0
Rental of boiler plant	6,000	5,000	0	0	0
Net cost of purchased service	**38,085**	**48,878**	**0**	**0**	**23,239**
Comparative cost per year for steam and electric service (except for intangibles)	**$47,897**	**$58,690**	**$71,833**	**$55,296**	**$72,811**

* 1,174,630 kw.-hr.

Plans Nos. 1, 3 and 4 suffice for comparative analysis in studying the make-up of Table I and the methods of preparing the economic estimates. The actual steam heating requirements of the hotel in 1932 are shown in Table II, from month to month, before the opportunity to utilize the skilled steam heating advice of the company's engineers had been seized.

In computing the costs in plan No. 1 it was estimated that if the hotel purchased both steam and electricity and relied upon the power company for utilization advice and supervision one chief engineer and four assistants would be required at a cost of $8,320 total per year. Subsistence was figured at $9 per month per man, or $540 per year. The other items are as shown in Table I under plan No. 1.

The estimated monthly steam requirements for space heating and other uses after the power company has effected its utilization plans are shown in Table III.

The analysis of plan No. 3, under which steam and electric service would be generated by the hotel and which involved purchase of an isolated plant, is summarized in Table I. This utilizes the existing hotel boilers. The net payment to the engine company under this plan during the first year would be $25,087, according to the power company's study. Fire insurance was figured at $3.25 per M on an engine price of $59,254, or $192. The labor requirements were increased and the set-up for isolated operation required one chief engineer (first class), four second-class engineers, four firemen and one electrician, whose pay totals $19,240. The computation of water required, exclusive of atmospheric exhaust (estimated at $500) called for 14,730,000.

Table II—Steam Requirements of Hotel "X" in 1932

	Total Steam M Lb.	Degree-Days	Total Steam Lb. per Degree-Day per M Cu.Ft. Gross	Space Heating Steam, M Lb. by Months	Space Heating in Lb. per M Cu.Ft. per Degree-Day
January	4,838	816	1.892	3,712	1.454
February	5,830	997	2.047	4,704	1.507
March	4,658	910	1.635	3,532	1.240
April	3,885	527	2.352	2,759	1.672
May	2,356	199	3.780	1,230	1.973
June	1,387	66	.....	261	1.263
July	1,116	...	.....	....	.....
August	1,136	...	.....	....	.....
September	1,280	73	.....	154	0.674
October	3,001	273	3.51	1,875	2.192
November	4,104	667	1.965	2,978	1.425
December	4,578	840	1.740	3,452	1.313
Totals	38,169	5,368		24,657	

Comments of Power Company on Engine Proposal

We have looked over the contract offered you (the Hotel "X") by the Blank Engine Company and have the following comments:

1. The contract price is $59,254, but you are to pay interest on the deferred payment at 6 per cent. If the full price is paid in 44 months you will have paid approximately $65,770.

2. The so-called "savings" are to be determined by short tests on new equipment. Tests are to be made by the engineers of the engine company.

3. Under the engine company's feedwater clause they can require you to install a new heater of expensive design if they desire. This is purely a "loophole."

4. It is up to you, the hotel owner, to segregate the steam and feedwater connections of the boiler during the test and to pay the cost of same, besides cleaning boiler for test.

5. The engine company specifies that the boiler shall show an evaporation of 10 lb. of water per pound of coal. This means an efficiency of 76.6 per cent. Your operation in 1928 indicated an efficiency around 50 per cent. The isolated plant would run at about 160 lb. gage pressure.

We have had a lot of experience with the operation of small boilers, and you will do well if you can maintain an efficiency of 60 per cent. The hotel plant contains two water tube boilers of 203 3½-in. tubes each.

6. The engine company has taken advantage of the hotel's optimistic statement on evaporation, which estimated an efficiency of 68.5 per cent and 10 lb. evaporation. These do not check.

7. The engine company credits you on the basis of 10 lb. evaporation and you will probably get between 7 and 8. You pay the difference.

This is a common strategy employed in these so-called "payment out of savings contracts."

8. It is up to you to weigh the coal and measure the output of the generator with meters "of known correctness." Who installs and pays for this? You, the hotel, do, according to the contract.

9. According to the proposal it is up to you to install weighing tanks to weigh the boiler feedwater during the test.

10. In case of any controversy with the engine company you pay on time, or the full amount of the contract becomes payable at once, without any deduction of items in question. Any financial difficulties, and the full remaining part of the contract price becomes payable at once.

11. Since no guarantees are made on water rate or anything else, in case of the above you have no further chance of getting anything from the engine company.

12. The engine company has the right to repossess equipment if payments are not made on time and keep all payment made as compensation for the use of the equipment.

13. If the engine company sells the equipment at a sale for $1 or any low figure, you are liable for balance unpaid on contract plus cost of repossessing, repairing and reselling.

14. You provide and maintain openings for getting equipment in and out during the life of the contract. Does this call for larger openings than are normally available?

15. You are to maintain equipment during the life of the contract. You will, of course, buy repair parts from the engine company at its own prices.

16. In the agreement proposed, you sign away your right of appeal from decision of arbitrators.

17. In case of failure of parts due to defective design or workmanship, you stand expense of removal, reinstallation and all freight to and from the factory.

18. The engine manufacturer does not guarantee any auxiliary equipment even though furnished as part of the contract. How about generators which are probably built by some one else? No specification or maker's name is given for generators.

19. You take all chances of delays or damages in shipment. You carry all insurance on equipment. In case of delay in shipment over which you have no control, you pay storage charges.

20. Piping specifications we would consider inadequate. Who furnishes exhaust pipe to the roof?

21. All credits for coal are based on a boiler room efficiency that cannot be maintained in service.

22. Any delays due to strikes, fires, tornadoes, etc., are to the advantage of the engine company. Payment starts 90 days after arrival of equipment in the city served by Hotel "X."

Summary of Engine Company's Proposals by Power Company

Contract price	$59,254
Contract and interest if paid at maximum speed possible	63,603
Contract and interest if just paid off in 44 months	65,770

If full price for equipment is not paid off in 44 months, interest will be greater.

Unit Cost of Equipment Installed if Paid Off at Maximum Speed:

Capacity, three 150-kw. units	450 kw.
$63,603/450 =	$141.50 per kw.

Money to Be Paid Engine Company Under New Proposal:

First year payments at $1,300 per month	$15,600
32 months following first year at $1,400 per month	44,800
Interest at $156 per month for 44 months	6,864
Total payments to engine company	$67,264
Unit cost of equipment $67,264/450 =	$149.47 per kw.

Table III—Estimated Monthly Steam Requirements of Hotel "X" After Utilization Work by Utility Engineers

Demand: A study of the results obtained in about 100 hotels served from district steam heating companies in practically all the large cities of the United States indicates that the maximum demand should not exceed 3 lb. per hour per M cu.ft. Therefore the Hotel "X" demand should be

3,132 × 3 = Approx. 9,400 lb. per hour.

Bogie: Steam used after utilization work is completed.

1932 Degree-Days		Lb. per M Cu.Ft. Gross per Degree-Day	M Lb. for Heating	M Lb. for Other Use	Total M Lb. Req'd	Estimated Bills—Steam	Estimated Bills—Demand	Estimated Bills—Total
816	Jan.	1.15	2,940	800	3,740	$2,250	$454	$2,705
997	Feb.	1.15	3,590	800	4,390	2,708	454	3,162
910	March	1.15	3,280	800	4,080	2,550	454	3,005
527	April	1.15	1,896	800	2,696	1,658	454	2,113
199	May	1.15	717	800	1,517	984	454	1,439
66	June	....	0	1,000	1,000	675	454	1,129
...	July	....	0	1,000	1,000	675	454	1,129
...	Aug.	....	0	1,000	1,000	675	454	1,129
73	Sept.	....	0	1,000	1,000	675	454	1,129
273	Oct.	1.15	983	800	1,783	1,129	454	1,583
667	Nov.	1.15	2,400	800	3,200	1,951	454	2,405
840	Dec.	1.15	3,025	800	3,825	2,313	454	2,768
5,368					29,231			$23,706

lb. at $1.05 per 1,000 cu.ft., or $248, making the water total $748.

Ash removal was figured at one cent per 1,000 lb. of steam generated. This total generation was figured at 54,600,000 lb. in the isolated plant operation scheme and the cost reached $546. Maintenance was estimated on the basis of 3 cents per 1,000 lb. of steam generated, totaling $1,638. Supplies, boiler compound, etc., were calculated at 2.5 cents per 1,000 lb. of steam and came to $1,365. Liability insurance was computed at $240, and subsistence at $1,080 for ten men.

The estimated net payment to the engine manufacturer during the first year was derived as follows:

A gross charge of $1,699 per month for electricity, or $20,396 for the year (omitting cents), and a gross charge of $2,470 per month for steam, or $29,644, plus interest aggregating $2,946, brings the gross payments to the engine maker to $52,987. From this would be deducted $27,900 in credits, making the net payment $25,087 to the engine builder during the first twelve months. These credits allowed by the engine manufacturer were obtained by summing up:

Rental of boiler room at $500 per month	$6,000
Cost of coal for high-pressure steam	1,920
Cost of generating electricity by test evaporation of 10 lb. per lb. coal, 1,464 tons at $5	7,320
Supplies, renewals and extra water	2,400
Boiler insurance	180
Ashes removal	600
Extra labor	9,480
Annual credit by engine maker	$27,900

To supply the same heat to the hotel as in 1932 and the same amount of electrical energy (1,174,636 kw.-hr.) assuming 60 per cent boiler room efficiency:

(a) **Heat for building:**

$$\frac{38{,}169{,}000 \text{ lb. steam} \times 1{,}053.4 \text{ (B.t.u.)}}{14{,}000 \text{ (B.t.u. coal)} \times 0.60} = 4{,}770{,}000 \text{ lb. or } 2{,}385 \text{ short tons.}$$

(b) **Heat to operate engines, exclusive of exhaust to atmosphere:** Rankine cycle, efficiency ratio on shop test, 80.7 per cent. Assuming 4,000 B.t.u. per kw.-hr. for engine-driven generators, the coal required for the 1932 consumption of energy would be

$$\frac{1.174.636 \times 4{,}000}{14{,}000 \times 0.60} = 560{,}000 \text{ lb., or } 280 \text{ short tons coal}$$

(c) **Heat in exhaust to atmosphere** requires 828 short tons coal

(d) **Total coal required** 3,493 short tons (at $5), $17,465.

Under plan No. 4 a computation was made by the power company as to the annual cost of operating steam and electric service by the isolated plant method, after the engine-generator units are paid for. (It was provided that 44 months would be allowed for this.) This was determined as follows:

Fixed Charges on Money Paid the Engine Company:	
13 per cent on $65,777 (including first cost of units and interest payments during the period of the engine contract)	$ 8,550
Fire insurance, at $3.25 per M on $59,254 (first cost)	192
Operating costs, same as plan No. 3	46,554
Total	$55,296

The plan (No. 5) for generating steam service and for buying electricity on the basis of the hotel's 1928 operations showed a total cost of $72,811. In this case the price of electricity purchased would run about 20 per cent above the cost under the complete utility service plan No. 1; no steam service would be purchased, but the cost of operating the hotel boiler plant for heating ran up to almost $50,000 in the computation compared with a steam heating bill of less than half this amount on the basis of plan No. 1. Thus, the data indicated to the hotel management the great value of the combined steam and electric service rendered by the efficient specializing organization of the utility company as compared with the cost of handling the problem by isolated plant steam and/or electric generation.

New proposal by engine company

A few days before the contract for steam and electric service was signed by the hotel and the utility company the engine manufacturer submitted a proposal under which the hotel could buy the units on a 44-month plan for a total of $67,264 by making a lower payment per month during the first year than in the later years of the term. An analysis of this proposal by the power company developed the total cost of operating the isolated heating and electric plant for the first year as $64,218; and for the second and third years, $65,418 each. These conclusions were reached as follows:

First Year Under Revised Proposal

Payments to Engine Company:	
On principal, per month, $1,300	$15,600
Interest, $156 per month	1,872
Fire insurance on same first cost of $59,254	192
Operating costs, same as plan No. 3	46,554
Total for first year	$64,218

Second and Third Years Under Revised Proposal

Same as above but with $100 increase monthly payments to the engine company (from $1,300 to $1,400, per year the total is 12 × 100)	$ 1,200
First year basic cost	64,218
Total for each of the two years	$65,418

Electric Shovels for Coal

Here are a Brobdignagian and a Lilliputian or, if you like a modern allusion better, here are Mutt and Jeff. Or if you are one of those sternly matter-of-fact engineers who frown upon such foolishness, here is simply a 20-yd. power shovel in contrast with a ½-yd. one. But however you look at it, the contrast is most striking. The big fellow, as well as the little one, made by Bucyrus-Erie and used by the Pittsburg & Midway Coal Mining Company to strip the overburden of earth from coal strata in Kansas fields, is powered with an 800-hp. Ward Leonard drive operating two 250-hp. hoisting motors and three 100-hp. for crowding and swinging. Power is supplied from a 4,000-volt overhead line to which connection is made with a cable laid on the ground.

Industry Resists Holiday Sag

Factory operations during December held up somewhat better, compared with November, 1933, than in any other year since 1925. On the basis of monthly statistics reported to ELECTRICAL WORLD of electrical energy consumption in industrial establishments, the decline in activity was only 3 per cent.

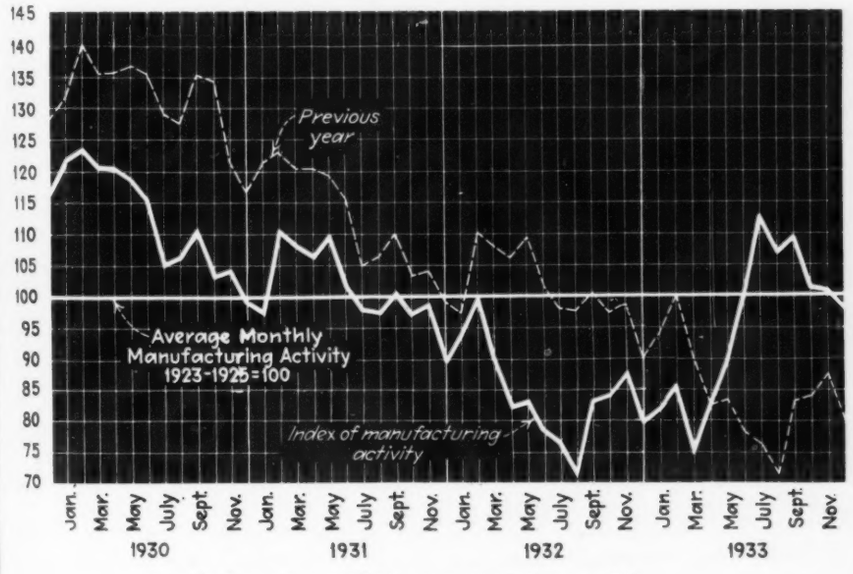
It seems to be the usual thing for work to slacken during the last months of the year, even in prosperous periods, be it on account of the weather, the time taken off in the holiday period, or the cessation of pressure to produce goods for the Christmas trade. The decline is generally around 5 or 6 per cent. In 1931 and 1932 it rose to 10 per cent.

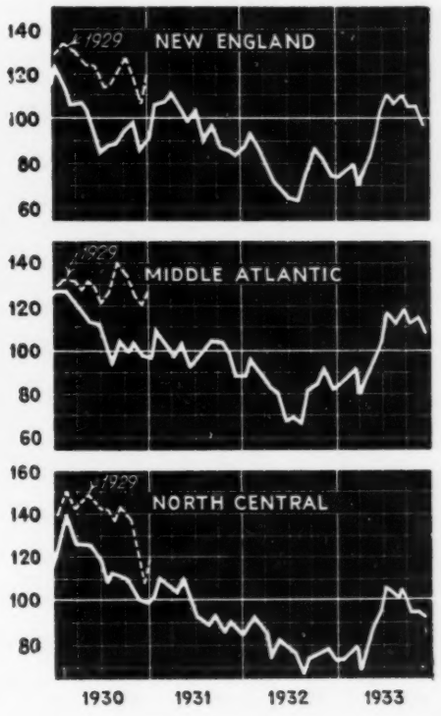
The small change in 1933 is therefore in the nature of a favorable omen. The effect was to widen the margin over 1932 to 23 per cent, whereas in November it had slumped to 15 per cent. This figure takes into account a revision of the November index numbers to include the returns received after the table published in the issue of December 23 had been compiled. In nearly every industry the revision was downward, reducing the national average for "all industry" by 1.5 per cent.

December operations were apparently to some extent affected by other influences in addition to those normally prevailing. The report from one large mill in New England, showing 20 per cent less energy used than in November, bore the statement that "during one week the plant did not operate. This was in compliance with the NRA code for December."

In the country as a whole operations continued uniformly above those a year ago, excepting the automotive industry. For the latter, some important returns are still missing. Their inclusion may bring a revision of the index. The drop from November in textiles leaves a 13 per cent gain over 1932. The metal working industries have for half a year held their level nearly constant, with a gain of 44 per cent over 1932 in December. Iron and steel fell from the late summer peak, but maintained a good lead over last year.

In New England textiles fell off, but the numerous metal-working plants have been holding up fairly well.





Index of monthly manufacturing activity

Base: Average month 1923-1925 = 100

(Corrected for number of working days, but not for seasonal variation)

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries and scattered throughout the country.

Industrial Groups	United States				New England				Middle Atlantic				North Central			
	Dec., 1933	Nov., 1933	Oct., 1933	Dec., 1932	Dec., 1933	Nov., 1933	Oct., 1933	Dec., 1932	Dec., 1933	Nov., 1933	Oct., 1933	Dec., 1932	Dec., 1933	Nov., 1933	Oct., 1933	Dec., 1932
All Industry	**97.9**	**100.9***	**102.0**	**79.4**	**96.7**	**104.0***	**105.0**	**75.2**	**108.4**	**112.0***	**113.7**	**83.3**	**92.3**	**92.3***	**96.7**	**72.1**
Automobile (incl. parts and accessories)	55.5	50.6*	52.1	56.2	....	....	....	....	65.7	61.9*	63.4	67.0	55.7	49.0*	50.7	55.6
Chemical products (incl. oil refining)	162.1	161.3*	160.0	124.3	166.9	164.8*	148.4	134.0	171.6	174.8*	172.8	128.0	136.8	140.7*	145.0	112.7
Food products	116.7	121.2*	120.3	103.2	....	....	....	....	125.7	127.3*	131.0	104.4	111.0	117.0*	115.2	97.3
Iron and steel	73.8	71.0*	83.5	54.0	129.6	130.2*	140.0	80.8	67.1	66.6*	72.5	45.6	73.9	70.1*	88.1	58.5
Metal working	76.1	76.3*	79.0	52.7	107.1	114.7	113.7	71.4	68.6	69.2*	68.5	52.2	74.6	73.0*	81.0	49.0
Metals group	75.3	74.5*	80.7	53.3	113.3	119.3*	121.0	74.3	68.0	68.2*	70.4	49.3	74.3	72.0*	83.8	53.0
Leather products	85.5	89.3*	91.2	79.8	64.4	69.7*	84.0	62.0	104.9	108.6	104.2	101.0	86.8	87.7*	81.5	79.0
Forest products	100.0	104.6*	100.6	83.5	51.7	56.5*	53.8	36.3	76.3	77.0*	71.5	54.0	86.9	91.9	99.0	67.3
Paper and pulp	127.0	129.8*	134.2	98.8	128.2	134.7*	144.7	101.0	104.3	105.0*	107.8	60.0	116.8	117.3*	125.3	93.3
Rubber products	108.2	115.6*	113.8	77.2	100.6	119.0	116.0	97.8	....	....	....	....	108.5	112.8	109.8	70.5
Shipbuilding	88.3	86.7*	83.5	84.0	....	....	....	....	....	....	....	....	....	....	....	....
Stone, clay and glass	81.6	91.5*	85.8	56.2	....	....	....	....	52.9	74.4	70.7	36.2	102.9	105.2*	106.2	66.5
Textiles	98.0	108.5	107.4	86.5	71.4	81.8*	80.7	63.5	141.4	149.1*	154.0	117.8	164.7	170.0	160.6	109.0

*Revision.

THIS WEEK'S NEWS

"New Dealers" Vilify E.E.I. Code

A ROMAN HOLIDAY is the best characterization of the utility code hearing in Washington last week. It started fairly and sanely as a fact-finding hearing and degenerated into a forum for airing opinions of governmental departments and agitators more suitable to soapbox orators than a serious conclave held under the auspices of the government.

Deputy Administrator L. H. Peebles was in the chair. NRA Attorney Richberg stated the procedure would be to take the testimony of witnesses as to facts, with the exception that those representing the government and state and municipal agencies would be heard at greater length in order to secure their views of the code. He stated the code was presented by private utilities only and said there was no attempt to coerce any public agencies.

P. S. Arkwright presented the code for the industry. He pointed out that utilities operated under special conditions such as continuous service and employment, regulation as to rates, financing and other practices; that they did an intrastate business very largely, with a wide variation in operating conditions; that because of pressure for rate reductions and regulation the industry was handicapped in carrying out the intent of NIRA, for compensating price rises cannot be forced, and that fair practices must prevail for all, and not a part of, the industry. He quoted data on employees, output, taxes, employment and other aspects of the business.

Judge William L. Ransom then presented and discussed the code and presented the supporting charts and statistics. He replied to a series of questions presented by Mr. Peebles that served to clarify the clauses of the code and to give reasons for the inclusion of the clauses. This presentation by Messrs. Arkwright and Ransom and the cross-questioning of Mr. Peebles launched the hearing auspiciously. Then came the deluge.

McNinch makes good a threat

Chairman Frank R. McNinch of the Federal Power Commission was first heard and premised his presentation by the statement that his remarks were offered in a constructive spirit and to avoid conflicts between the regulatory authorities and the code authorities. Mr. McNinch had promised strong opposition (ELECTRICAL WORLD, January 13, page 90). He stated that a healthy private utility industry was essential to national well-being, but that regulatory authorities were confronted with vexatious problems and some wrong and unworthy practices in the present conduct of the business. He said all must frankly and candidly recognize the social aspects in the psychology of the new deal. "There is a new era and a new order and old things have passed away." There must be a larger recognition of the public interest in public utilities. He stated that the Federal Power Commission had very grave doubts of any legal authorization in NRA to impose a code on the utility industry that went beyond labor provisions. In his opinion the NRA does not contemplate a fair practice code for the regulation of destructive competition in an industry that is monopolistic and having little if any competition. Further, the NIRA provides explicitly against the promotion of monopolies and yet no one desires to destroy the essentially monopolistic aspect of the utility business. It is lawful and desirable. The Federal Power Commission believes there is no field for a code such as is submitted, whatever be its purpose, because in a degree it usurps the federal and state regulatory functions. There is a realm of haze and obscureness in the clauses of the code, and this in itself affords evidence that the industry should not have this kind of a code. The code authority must be the interpreter and arbiter of these clauses, for the NRA administrator has only negative powers under this code.

Mr. McNinch objected to the numerical constitution of the code authority, stating that if this were an oversight it could be corrected: if deliberate, then those who framed it do not comprehend who should operate it. The E.E.I., when organized, consisted of seventeen holding and five operating companies. The code is supposed to regulate and supervise operating companies. "Then is it not strange that only five of the 22 E.E.I. trustees are representative of operating companies?" What is the effect of this on the constitution and operations of the code authority if the holding companies select the nine members? This fact stigmatizes the constitution of the code authority and of the code committee as unrepresentative of the operating companies. In the opinion of Mr. McNinch the proposed code is one drawn up by holding companies and to which operating companies and municipals would be subjected. He said that the statements filed by the industry in support of the code also clearly showed that it was the purpose and intent to coerce the government agencies into subscribing to the code despite the clauses in the code itself. If they were coerced they would have one representative out of twelve on the authority. If it is the intent to permit government agencies to participate in code provisions why not give them fairer representation?

Mr. McNinch entered very positive objections to the proposed co-operative survey of power resources. The President and the Congress have authorized the Federal Power Commission to [illegible] this and the work is in hand. He objected to a parallel survey or any parallel, even semi-official, authorization for a duplication of this work. He also objected to the statement in the code that the sale of appliances is in the public interest because of the inferential effects this would have on fixed capital and operating accounts of the power industry. This conflict is avoided if this is purely a retail code function. He also stated that the proposed public representatives were simply unpaid observers with no effective influence upon code operations. In conclusion, he said there was no justification, by reason of competition or other reasons, for suggesting that governmental agencies come under a code operated by private industry, although he personally was inclined toward a fair code that would include the entire industry.

Richberg in the ring

This statement drew an explanation from Attorney Richberg of NRA. He said the Administration felt that the utilities represented a large fraction of national employment and that their employees were entitled to NRA participation. So public utilities were urged and pressed to apply for a code. The proposed code, however, is only proposed and not approved and the present hearing is part of the approval procedure. NRA felt it could hardly invite municipal and government utilities to propose a code, for NRA took the position that it had no power over these utilities. NRA did assume, however, that it might be possible for the govern-

mental agencies to agree voluntarily to the labor provisions of a utility code, but NRA insisted that this be voluntary and there was no stigma intended for those who did not subscribe. In regard to the power survey work, it was his assumption that this involved no duplication of work, but would utilize and supplement all available information. Mr. McNinch said he had made no objections to the labor provisions of the code and heartily supported the intent of the NRA, but he did object to the proposed power survey, to some aspects of the fair practices suggested and to the constitution of the code authority.

Soapboxes in demand

Next came Henry T. Hunt, who said he spoke for the Secretary of the Interior and for P.W.A. He premised his remarks by stating it was their desire to be co-operative and constructive. The Secretary of the Interior has a large stake in the code because of present and prospective utility operations of federal agencies. It has the Bureau of Reclamation projects, Boulder Dam, Grand Coulee and other projects. It has allocated $11,000,000 to municipal plants and has application of the same type for $135,000,000 in addition. Much of this power will be sold through existing utilities and it is essential that the utility code be co-operative. The position of the Secretary of the Interior was stated to be: (1) The electrical industry is not an industry such as stated by Title 1 of the proposed code; it is by nature monopolistic; (2) if the electrical industry is one in which a code is authorized, the E.E.I. is not eligible to present the code, nor is it truly representative of the industry; (3) the code submitted is not in the public interest and will be used further to despoil the public; just because the members of E.E.I. put on snow-white vestments they are not saintly, nor have they lived down the records of the N.E.L.A., and (4) discussion of any code proposed under such discredited sponsorship is wasted labor.

But, nevertheless, Mr. Hunt proceeded to discuss the code. There was no provision for cost accounting on appliance sales and this activity was under investigation now by the Federal Trade Commission. The steam industry should be eliminated. The definition of the industry does not include holding companies, yet they are the dominant factors and the dominant power. The code authority should dominate the holding companies, but this code provides for the domination of the industry by the holding companies. Any sponsoring by the federal government of the unholy practices of the holding companies is unwise. The power to administer the code is in the hands of E.E.I., and this was the primary object of the holding companies in proposing this code. Despite NRA the E.E.I. directly fixes labor conditions and wage rates without permitting any opportunity for collective bargaining or employee representation. Neither the hours nor the wage rates carry out the purpose of NRA. The wages do not afford a decent standard of living and the hours will not increase employment. The effect of Article II is to let the holding companies dominate and reinforce them in their "sinister" practices. In Article VIII rules in the interest of investor and consumer are lacking. Vague provisions are given as regards detailed financial information. In Article IX the code can only be modified by act of the holding companies and in their interests. Government agencies are not eligible for the code. Private utilities have done their utmost to destroy publicly owned plants and municipal and governmental agencies will come under this code at their own peril, even if it is legal for them to do so. The Power Survey provision conflicts with the present authorization of the Federal Power Commission. In conclusion, the suggestion was made to rewrite the code so that: (1) Holding companies shall be deemed operating companies; (2) all contracts between holding and operating companies shall be unlawful except as they provide for actual cost of services rendered; (3) no operating companies can lend money to a holding company; (4) any personal profit shall be prohibited to any officer of a utility through financial transactions; (5) no bonus payments shall be permitted; (6) cost of service by classes of consumers shall be obtained and used for rates; (7) all advertising programs of utilities shall be submitted in advance to the NRA administrator and all advertising must receive his approval; (8) reduce all domestic rates and make them uniform, (9) investigate action of any member and then discipline if guilty; (10) no financing by the utility of taxpayers' suits or injunctions. To climax the situation it was recommended that:

1. If a code is approved it shall not be sponsored by E.E.I.
2. It shall carry out the purposes of NRA.
3. It shall provide for a 30-hour basic week and for wages sufficient to give a decent standard of living.
4. The Secretary of the Interior declares his firm opposition to any code sponsored by the E.E.I.
5. The records of the Federal Trade Commission will support the facts and opinions expressed.

Evidence of disapproval of this testimony and of the abusive language by some utility men in the audience drew a remark from Mr. Richberg that while facts were desirable, it had been decreed in the opening statement that government officials should have full liberty to express opinions as well as facts.

Congressman Kvale expressed opposition to the code, especially as to the inclusion of municipal plants. Utility Commissioner Riley Elgin and Assistant Corporation Counsel W. A. Roberts of the District of Columbia made objections on the code such as: The selection by kilowatt-hour basis puts Middle Atlantic States in control, the exemption clause when competition occurs is evasive and might permit a utility to avoid all fair practices and labor provisions because of one municipal operation in its territory.

> **"If the Blue Eagle of the National Recovery Administration is to have any place in the electric industry, it ought not to be withheld from operations in the industry that are operated or financed by government, which should not seek to impose on privately operated business and investments any standards of fair competition, and any requirements as to wages, hours and conditions of labor, to which government will not ask or require that its own enterprises be conformed, in the common cause of national recovery. The natural and logical unit for which codes of fair competition may fairly be established under the recovery act is the industry, irrespective of the ownership of some of its parts by government itself."**
>
> So contended Preston S. Arkwright, chairman of the code committee of the electric light and power industry, in a formal statement before NRA last week.

Labor says its say, too

And another climax of doubtful procedure and opinionated expressions occurred when the New York Edison labor situation was aired. T. Donovan and T. A. Keppler, speaking for the Edison Equity Employees Association, recited the recent troubles in New York. They condemned the company union and Mr. Keppler suggested a complete labor protective code, including provisions for old age pensions, unemployment insurance, 30-hour week and untrammeled employee organization.

On Saturday morning the hearing opened with testimony by R. C. Berry, representing the Brotherhood of Edison Employees and other organized groups of workers not affiliated with A. F. of L. He said utility workers would be organized and organized effectively despite the company unions. He quoted data to show the prosperity of the utility during the depression in contrast to employee and payroll figures. He cited a decrease in number of employees of 9,190 from 1927 to 1932, with a decrease

Coming Meetings

American Institute of Electrical Engineers—New York, N. Y., January 23-26. H. H. Henline, 29 West 39th St., New York.

American Wood Preservers' Association—Houston, Tex., January 23-25. H. L. Dawson, 111 W. Washington St., Chicago, Ill.

Canadian Electrical Association, general conference of committees—Montreal, Que., February 5. B. C. Fairchild, 409 Power Bldg., Montreal.

Oklahoma Utilities Association—Tulsa, Okla., March 6-7. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

American Society for Testing Materials—Washington, D. C., March 7. C. L. Warwick, 1315 Spruce Street, Philadelphia, Pa.

Electrochemical Society — Asheville, N. C., April 26-28. Colin G. Fink, Columbia University, New York.

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in payrolls of $64,000,000. He said the 67 exemptions in hours and wages in the code made the labor provisions meaningless and inoperative. He said there was no justification for the classification and that the 30-hour week should be used, with 36 hours for employees on continuous duty. He proposed a $20 per week minimum for unskilled labor, $24.50 for semi-skilled and $32.50 for skilled labor. He said that the P.R.A. had not increased employment or payrolls and urged the utility industry to show its sympathy with NRA principles by really putting into effect the hours and rates suggested.

Mr. Berry also suggested: (1) Relief from coercion of employees to purchase company securities; (2) relief from coercion of employees to sell securities; (3) relief from the same coercion to make appliance sales; (4) relief from coercion upon employees to engage in political activities; (5) adequate labor representation on the code authority, and (6) the establishment of an industrial relations board. He challenged the wage and re-employment figures presented by the code committee and reported the data of a survey made by his organization.

More from the labor camp

C. L. Reed presented a brief for the International Brotherhood of Electrical Workers. He said the proposed hours, rates and labor clauses were ridiculous and inadequate. He said the majority of workers were skilled and should have a base rate of $1.20 per hour, with 56 cents per hour for common labor. He protested the exploitation possible under the learner clause and objected in detail to most of the exemption labor clauses. He said the maximum hours per week should be 30. He said the National Electrical Safety Code should govern all construction work. He said utilities should be prohibited from supporting company unions by use of money paid by customers.

In the middle of the presentation Attorney Richberg interrupted the speaker to make a statement. This, apparently, was a repercussion that resulted from the testimony of Friday. He said: "In view of the questions raised by other departments of the government on the proposed code it is advisable to make a statement. The position of NRA is that it is proceeding in accordance with the law. The private utilities come clearly within the province of NRA and NRA insisted that they sign P.R.A. and present a code. It is therefore hardly appropriate for departments of the government to rebuke the industry and to challenge NRA. A code for a natural and acceptable monopoly does not conflict with NRA. A code does not grant a monopoly or promote one. There is as much need for a code in the private utility industry as in any other industry. The most unfair competition is that possible in overworking and underpaying labor. These utilities are in competition for the consumer's dollar for their services and products. It is just as necessary to protect public utility employees with hour and wage agreements as it is to protect employees in any other industry. It is just as fair to prevent unfair competitive practices in this as in any other industry.

"NRA recognizes the regulatory power of the federal and state authorities and would not infringe them, for the private utilities cannot be placed under a code that is unlawful. The NRA considered all these facts carefully and came to conclusions that should have more weight than those expressed quickly and without due consideration of all facts. The code proposed has not been approved by NRA and does not commit NRA. It will save time, however, if the usual rules of code procedure are used. We have declined to permit any code hearings to degenerate into personal abuse of any one," Mr. Richberg continued to soliloquize. "The moral garments of those sponsoring a code may be very soiled, but the operations of a code hearing should not be associated with a cleaning and dyeing establishment. The purpose of this hearing is to get a code of fair practice, not to abuse sponsors or to challenge NRA. The remainder of this hearing will be devoted to an orderly taking of evidence." This statement of Mr. Richberg came late, but when made changed the atmosphere very appreciably. Further evidence was confined to facts and to the code. Several labor representations were heard in objection to the hours and wages and others filed briefs. L. W. Davis, representing the contractors, suggested changed provisions, including: (1) No appliance or wiring sales to customers at less than cost and no part of this cost should be charged to the cost of service; (2) free lamp renewals should be stopped. The wholesalers also objected to free lamp renewals.

Cuban Properties Seized as Governments Shift

With the passing of the Grau San Martin régime in Cuba, through acquiescence to the request of the revolutionary junta, electric light and power enterprise on the island has entered a new phase. One Carlos Hevia ascended to the Presidency and the government took full possession of the plants and property of the Compania Cubana de Electricidad. Mendieta succeeds Hevia.

According to President Roosevelt's personal representative in Havana, Jefferson Caffery, the revolutionary government is operating the system. A decree has been issued which, after citing failure of the company and the union to agree on outstanding demands of the latter and alleging non-compliance by the company with "accepted agreement," announced the "provisional intervention in all the offices, plants and shops of the company to be carried out by the Departments of the Interior and War with the help of the public forces." The decree provides for government operation as long as "may be judged necessary by the Executive" and, until an agreement is reached with labor, all expenses incurred to be charged against the company.

Thus the long disputes with the Grau San Martin administration (ELECTRICAL WORLD, December 23, 1933, page 807) come definitely to a close.

Democrats in Senate Oppose St. Lawrence Treaty

Many weeks of recurring debate are in prospect on the St. Lawrence treaty, which at the present time lacks the two-thirds vote necessary for its ratification by the Senate. The President sent to Congress last week a vigorous message advocating the combined power and waterway project, although Robert F. Wagner and other Senate Democrats had served notice that on this issue they would not follow their leader. As chairman of the committee on foreign relations, Senator Pittman of Nevada presented the treaty to the Senate with an eloquent address, but opponents were well armed with a minority report by Senator Wagner, which asserted that the project would cost $573,000,000 rather than $272,000,000, that it has been outmoded by a new economic trend defined in the decline of export trade and that the waterway would neither relieve traffic congestion nor compete effectively with the railroads. At a treaty conference called later at the White House, the President asked the Democrats favoring the treaty to do what they could to win over their recalcitrant colleagues.

More Cities Vote for T.V.A. Knoxville Gets P.W.A. Loan

Developments in the realm of the Tennessee Valley Authority were fairly numerous but of minor importance this week.

Amory and Corinth, Mississippi towns, by respective votes of 613 to 12 and 791 to 21 have voted to take advantage of connections with T.V.A.

Mayor Bass of Chattanooga, with City Attorney Anderson's opinion of the legality of the step to back him, states that citizens will be given an opportunity to vote on the acquisition of power plant facilities for the distribution of T.V.A. energy there.

Knoxville has received a loan of $2,600,000 from the Public Works Administration for the construction of a distribution system for energy purchased from T.V.A. The city sought $3,225,000, which included the cost of future extensions. It is reported that Knoxville has not offered to buy the existing facilities of the Tennessee Public Service Company.

Several communities previously clamoring for T.V.A. power are reported to be abandoning action toward that end now that territories have been more definitely defined. Gadsden, Ala., has postponed an election on the matter. Towns outside of the T.V.A. area which have already voted for government-produced power, but which are unlikely to get it, are Guntersville, Oneonta, Jasper, Bessemer, and Tarrant City, all in Alabama.

Securities brighten outlook

Public feeling that the definition of territory has removed the Damoclean sword hanging over private utilities has been reflected in higher prices for local utility stocks. Alabama Power 7 per cent preferred, for example, which sold for $25 in December and was selling for $30 the day before, went to $40 after the terms of the T.V.A. contract with the utilities were announced.

Federal Trade Hearing

Following supplementary hearings on the Electric Bond & Share Company, last week, the Federal Trade Commission scheduled for this week a hearing on the Iowa properties of companies affiliated with the North American Light & Power Company.

Mail-Box Deliveries End

Despite utility company protests, Postmaster-General James A. Farley has refused to alter his recent order that circulars, bills and other printed matter be kept out of individual mail boxes in the future. Utility officials explained that a needless burden of expense would be placed on their companies if they were forced to use the mails for sending out light and gas billings. In addition, it would mean the dismissal of employees now circulating these bills. Mr. Farley retorted that the local rate had recently been reduced to 2 instead of 3 cents to take care of such contingencies.

Insull Collusion Charges To Be Heard Soon

Taking full cognizance of the petitions from Charles A. McCulloch, receiver of the Middle West Utilities Company (ELECTRICAL WORLD, January 13, page 91) and Samuel Ettelson, lawyer, who brought the original charges of collusion, Federal Judge Walter C. Lindley has ordered an exhaustive inquiry into the Insull receivership litigation to determine if actions involved in it were collusively brought and fraud practiced upon the court. Filing of Mr. Ettelson's petition, which asked either the dismisal of the entire Middle West receivership proceedings or the removal of Mr. McCulloch and his counsel, was allowed and he will be a party to the investigation. All other parties will have ten days to answer Mr. Ettelson's charges and on January 23 will be held what Judge Lindley called "a town meeting" to decide upon method of procedure.

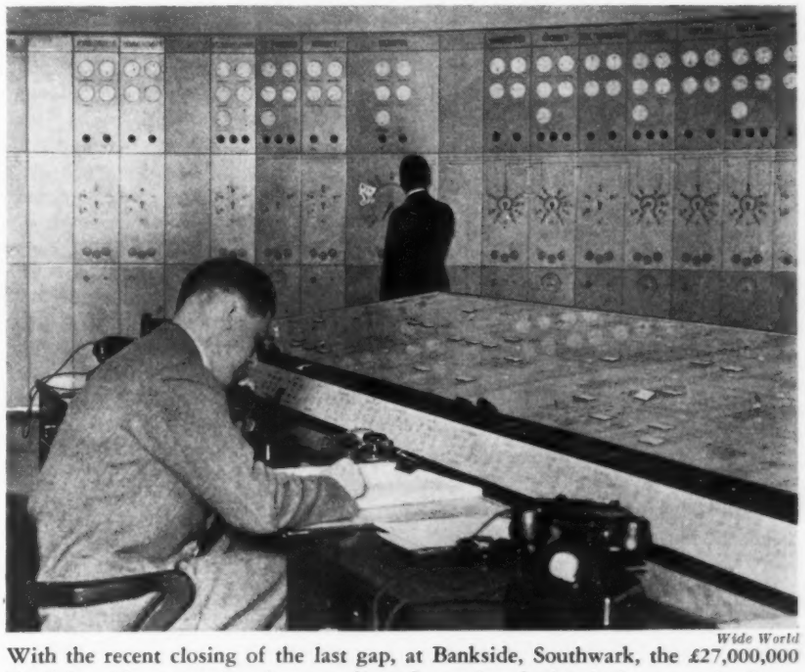
Martin J. Insull's motion for discharge from custody was dismissed January 15 by Justice Charles Garrow, in Toronto, who denied his plea to set aside an order for extradition to Illinois to face charges of larceny, embezzlement and theft by bailee. The plea was based on the claim that he was illegally held in Canada. Upon the announcement of the decision, Mr. Insull was taken to the police station, but was released soon in bonds of $20,000 and returned to his home in Orillia. His counsel expects to take the case to the Ontario Court of Appeals.

Dimitri Maximos, the Greek Foreign Minister, said last week that Samuel Insull must leave Greece by January 31, despite an appeal to the High Court. "Minister of the Interior Metaxas made a plain declaration that Insull cannot stay any more in Greece," M. Maximos said. "The decision must be executed."

Sodium Lights at Revere

Characterized by engineers as the largest sodium-vapor units to be used thus far for street lighting, the eleven 10,000-lumen lamps placed in service at the Broadway-Revere Beach Parkway overpass in Revere, Mass., last week are also notable as being the first commercial types of strictly alternating-current sodium-vapor sources to be placed in service in the United States. Experimental work with 4,000-lumen General Electric sources at Schnectady and Port Jervis preceded this installation.

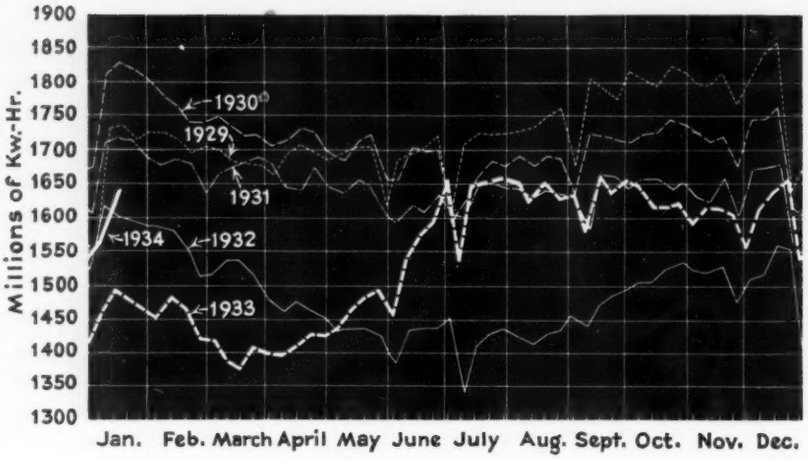
CONTROL CENTER OF THE ENGLISH GRID



Wide World

With the recent closing of the last gap, at Bankside, Southwark, the £27,000,000 English grid system for the co-ordinated supply of electrical energy in Great Britain became an operating entity. With that final linking of the last isolated element to the main scheme 50 small and relatively inefficient generating stations were shut down. The national grid involves 26,265 towers and 4,000 miles of lines. From this center operations of the scheme are centralized.

Output Jumps After Holidays



Rising to 1,646,271,000 kw.-hr., and thereby closely approaching the mid-December maximum, electrical energy production during the week ended January 13 surpassed last year's figure by 10.1 per cent, according to the Edison Electric Institute. It exceeded the output two years ago by 2.8 per cent. The margin over the preceding year has been gradually widening since the beginning of November, when it was down to 3.8 per cent.

In New England, in the South, and in the Middle Atlantic and West Central regions with the exception of the preceding week, the year's gain was the largest since early autumn. The Mountain region continues nearly 20 per cent and the Central industrial about 13 per cent ahead of last year.

Weekly Output, Millions of Kw.-Hr.

1934		1933		1932	
Jan. 13...	1,646	Jan. 14...	1,495	Jan. 16...	1,602
Jan. 6...	1,564	Jan. 7...	1,426*	Jan. 9...	1,619
1933		1932		Jan. 2...	1,524
Dec. 30...	1,539	Dec. 31...	1,415	1931	
Dec. 23...	1,657	Dec. 24...	1,554	Dec. 26...	1,565
Dec. 16...	1,644	Dec. 17...	1,563	Dec. 19...	1,676

*Slightly revised from data previously published.

Per Cent Change from Previous Year

Region	Week ended Jan. 13	Jan. 6	Dec. 30
New England	+ 9.2	+ 8.7	+ 8.7
Middle Atlantic	+ 8.6	+11.3	+ 6.2
Central Industrial	+13.1	+13.0	+14.3
West Central	+ 8.8	+ 9.3	+ 4.3
Southern States	+10.4	+ 1.3	— 3.7
Rocky Mountain	+19.8	+19.1	+19.5
Pacific Coast	+ 3.5	+ 3.4	+ 8.6
United States	+10.1	+ 9.7	+ 8.8

Canadian Output Up by Nearly 18 per Cent

Canadian central electric stations had a materially larger output in November than in October, and gained 17.5 per cent over the corresponding month in 1932. As reported by the Dominion Bureau of Statistics production was 1,702,558,000 kw.-hr. against 1,617,751,000 kw.-hr. in October. Figures for the month in 1930 and 1931 were far surpassed.

Production from water power in Quebec was 888,123,000 kw.-hr. or more than half the Dominion total and 8 per cent ahead of the preceding year; in Ontario it was 492,932,000 kw.-hr., 48 per cent higher. Recent months have brought an extraordinarily rapid increase in that province.

South Carolina Rural Lines

By abolishing Rule 27 of the regulations governing the operations of electric utilities in South Carolina, the state Railroad Commission has paved the way for a greater rural electrification program. The rule provided that before a power company could be required to install an extension in its lines it must be shown that the revenue derived therefrom over a three-year period would be sufficient to cover the construction costs. By this action the commission has established a basis allowing for every proposed project to stand on its own merit and has made possible the taking into consideration of general conditions and circumstances as well as how much revenue the extension produced. Rule 27 had applied to water and gas extension as well as to electric rural distribution lines.

Geological Survey Estimates Gains Over 1932 for 1933

Public utility plants generated 7,209,000,000 kw.-hr. in November, the U. S. Geological Survey reports. This was 4 per cent more than the output a year ago. October production was 7,491,000,000 kw.-hr. and the year's gain for that month was 6 per cent. Average daily production in November was 0.6 per cent less than in October, whereas the normal change is an increase of 0.7.

Production by water power constituted 35 per cent of the total and was about 13 per cent less than a year ago.

Including the estimated output for December, the monthly records indicate a total for 1933 of 85,300,000,000 kw.-hr. This comprises all public utility plants, not alone those for light and power. The amount is nearly 3 per cent more than the production in 1932. This is the first annual increase since 1929.

Comparative gains in monthly output, in per cent, by geographical regions were as follows:

	October	November
New England	+10	+ 7
Middle Atlantic	+ 2	+ 4
East North Central	+ 8	+ 8
West North Central	+ 3	+ 2
South Atlantic	+ 6	— 9
East South Central	+ 2	— 5
West South Central	+ 7	+ 4
Mountain	+29	+25
Pacific	+ 5	+ 5
United States	+ 6	+ 4

$4,800,000,000 Invested in Telephones Says Census

At the end of 1932 there were 17,424,396 telephones of public telephone systems in use in the United States, two-thirds of them residence instruments, according to the quinquennial census. Investment in plant and equipment was $4,791,611,280, operating revenues $1,055,800,925 of which salaries and wages absorbed 43 per cent.

The accompanying table gives comparative figures for 1932, 1927 and 1922, those for 1932 being preliminary and subject to revision.

Principal Telephone Statistics—All Systems and Lines: 1932, 1927, and 1922

	1932	1927	1922	Percent of increase 1927–1932	1922–1927	1922–1932
Number of systems and lines	44,825	60,148	57,253	−25.5	+ 5.1	− 21.7
Total miles of wire	87,491,182	63,836,182	37,265,958	+37.1	+71.3	+134.8
Number of telephones	17,424,396	18,522,767	14,347,395	− 5.9	29.1	21.4
Residence	11,089,850	12,128,617	(1)	− 8.6	....	....
Business	6,334,546	6,394,150	(1)	− 0.9	....	....
Number of calls originating with systems reporting	30,048,365,513	31,614,172,621	24,647,560,860	− 5.0	+28.3	+ 21.9
Number of central offices	19,207	20,227	19,260	− 5.0	+ 5.0	− 0.3
Revenues, operating	$1,055,800,925	$1,016,944,410	$655,236,548	+ 3.8	+55.2	+ 61.1
Number of employees	334,085	375,272	312,015	−11.0	+20.3	+ 7.1
Male	128,677	131,802	104,433	− 2.4	+26.2	+ 23.2
Female	205,408	243,470	207,582	−15.6	+17.3	− 1.0
Salaries and wages	$458,116,677	$486,597,070	$352,925,570	− 5.9	+37.9	+ 29.8
Investment in plant and equipment	$4,791,611,280	$3,548,874,716	$2,205,183,150	+35.0	+60.9	+117.3

(1) Not called for on schedule.

As to Rates—

• Consolidated Gas Company's electric properties have been given a stay of the commission's rate reduction order pending determination by the Appellate Division of the certiorari proceedings brought in December by the companies. Decision was handed down this week by Supreme Court Justice G. V. Schenck. The commission had granted an extension until January 20.

• New Jersey Board of Public Utility Commissioners in its annual report submitted last week to Governor Moore asked an appropriation for employment of special engineers and experts to make a study of rates. "Since there has been a downward trend in the price of commodities generally, the utility companies should likewise adjust their rates for the benefit of the individual customer, who finds it difficult and burdensome to pay for this service on a reduced income," the report said. The commission reported the revenues of the 587 utility companies under its jurisdiction declined $36,054,000 in 1932, while operating expenses dropped only $3,953,617.

• Utah Power & Light Company's allied corporations are likely to become involved in the general power rate case brought by the Public Utilities Commission of Utah as a result of the proceedings initiated last fall by the United States Army (ELECTRICAL WORLD, November 25, page 682). The newly organized Consumers' Welfare and Research League has recently petitioned the commission to amend its complaint to include the various corporations affiliated with the Utah utility. The petition, naming the Electric Bond & Share Company, the Electric Power & Light Corporation, the Phoenix Utility Company, the Idaho Power Company and the Utah Light & Traction Company, asks that the scope of the action be enlarged to include an inquiry in respect to the reasonableness of the charges, fees and exactions made upon the Utah Power & Light by its affiliated organizations.

Texas rate law unconstitutional

• Texas-Louisiana Power Company was upheld by the Texas Supreme Court in a recent decision which viewed as unconstitutional an act of the Legislature empowering towns of less than 2,000 population to fix utility rates charged. The city of Farmersville was seeking to prevent its own electric light plant being underbid by the Texas-Louisiana company, which ignored a city ordinance fixing all electric light charges at those collected by the municipally owned plant. The power company made much lower charges and the litigation resulted. In this decision of the Supreme Court the trial court was upheld and the Dallas Court of Civil Appeals reversed.

• Kansas Public Service Commission has been upheld by the Supreme Court of the United States through denial of an injunction barring the commission from investigating and making findings as to reasonableness of rates charged by distributors of natural gas. The decision, however, left the way open to public utilities to contest rate orders issued by the commission on the grounds that they are confiscatory and authorized an injunction against the commission ordering reduction in rates to the consumers without hearings. The opinion of the high court was rendered in the suits brought by ten utility companies controlled by Henry L. Doherty, against two decrees entered by the Kansas commission.

More Long Island troubles

• Long Island Lighting Company's witness, W. V. Burnell, engineer, at a rate investigation before the New York Public Service Commission has admitted that in setting up his valuation of the lighting company on a reconstruction cost basis he had failed to include actual quantity discounts on certain electrical equipment, in spite of the fact that the utility had more than $1,000,000 invested in such equipment. Colonel Blakeslee, counsel for the commission, explained that the General Electric Company usually gives a year-end discount, based on quantity, and that Mr. Burnell had used only a 10 per cent discount in his valuation. That electrical equipment at Camp Upton, L. I., constructed during the war for the United States Government by the Long Island company on a cost-plus-profit basis, was repurchased by the utility company after the war at a greatly reduced price, but this price was carried on the books of the company at the original cost-plus-profit figure, was brought out at the hearing. Evidence showed that the utility purchased poles from the Frankfort Lumber Company of Columbus, Ohio, which is controlled by the brother-in-law of E. L. Phillips, president of the Long Island Lighting Company. The lumber company was reorganized and these poles are first purchased by E. L. Phillips & Company and then resold to the lighting company at a fee.

• Indiana Public Service Commission has declined to heed pleas by attorneys for a number of large utility companies in the state that its order abolishing penalty rates for delinquent ratepayers be modified. The commission, in abolishing the penalty and gross rate system, made provision for collection charges which, it is contended, are less than charges now made under the system in use for years. Attorneys for the Public Service Company of Indiana and the Northern Indiana Power Company, two of the largest gas and electric utilities in the state, presented memoranda in which they said compliance with the new order would cost their companies nearly $50,000 annually apiece.

• Public Service Company of Northern Illinois' engineering staff testified in substantiation of a valuation of $167,000,000 reproduction cost, new, for the company's properties as of November, 1933, at a recent hearing before the Illinois Commerce Commission. That valuation, prepared by Albert S. Richey, engineer of Worcester, Mass., is contested by commission experts who estimated plant and equipment at between $115,000,000 and $133,000,000. The Richey valuation includes $23,000,000 added to the other assets because the company is "a going concern." S. B. Cushing, chief statistician of the company, testified that an electric rate reduction of 5 per cent, if ordered by the commission, would save the average customer of the company about half a cent a day, or $1.80 annually, and would cost the company approximately $450,000 in revenues annually. Edward B. Hall, vice-president of the Harris Trust & Savings Bank, stated that the company in order to maintain its credit should have a minimum rate of return of 7 per cent to 7½ per cent. Commission experts have testified that a 6 per cent return would not be unfair.

• Massachusetts Department of Public Utilities, in reporting to the Senate on an order requesting the department to inquire into the feasibility of prohibiting service charges, has upheld such items. In its report the commission says: "In our opinion a service charge, limited as it has been in this Commonwealth, is a just charge. Where we are convinced, as we are, that it is just we see no reason why it should be prohibited on the ground of feasibility or expediency. In many communities we have found that it is preferred to a step-rate or an area rate, where the charge for the service is concealed. To prohibit the making of the charge would merely mean the denial of a method of recovering the service cost in communities where the great majority of the customers find it the least objectionable and requiring the imposition of a step-rate or an area rate which is less satisfactory to them. We affirm what was said by the department commissioners in their report to the Legislature in 1921, that 'While the department is by no means of the opinion that service charges should be indiscriminately adopted, yet it is convinced that such a charge may not only be justified under some circumstances but perhaps be the only practicable means of adjusting fairly the relative payments which customers should make for the services respectively rendered them.'"

FINANCIAL AND BUSINESS

New York Tax Return

Collections by New York City of the emergency tax of 1½ per cent of net profits of public utilities operating within the city limits totaled $1,491,753.64, plus $318.23 in penalties for September, October and November. Since the tax goes out of existence March 1, this would indicate total receipts of about $3,000,000. Some utilities, however, have paid nothing, arguing that they are not properly taxable. Those that have paid have done so under protest.

Budget Investigations Continue in Washington

Undaunted by opposition to its authority expressed by the Puget Sound Power & Light Company (ELECTRICAL WORLD, January 13, page 91), the Washington Department of Public Works, E. K. Murray, director, has filed objections to items totaling approximately $500,000 in budgets of 23 utility companies, and operators are cited to appear at hearings to show why these items should not be stricken. Most of the items objected to are management charges to non-resident companies, regulatory expense and donations to chambers of commerce and other organizations. Previously the department had filed objections to such items, and also to salaries of executives of the larger telephone and power companies (ELECTRICAL WORLD, December 23, page 808).

Wiring in Los Angeles

Los Angeles has joined Portland and San Francisco as the third metropolitan center on the Pacific Coast to invoke an ordinance governing the standards of electrical appliances sold to consumers. The new ordinance is similar to those in effect in the other two cities and contains the provision that only appliances approved by the Underwriters' Laboratories may be sold to the public. Provision is made for receiving local temporary approval pending such final acceptance.

BOOM

In proportion to the hitherto undemonstrated ability of directive forces to stick to a program once formulated is the currently announced plan for a 50-60-cent Roosevelt dollar of either significance or constructive import. Security markets may whirl in hope or in terror, commodity prices may sweep upward, but only plans with better chances of permanence than their predecessors are ultimately steadying.

Meanwhile, business continues to do better and better. The upswing of energy production reported this week is of notable importance; the gap over the preceding year has widened to a gain of 10 per cent. Bituminous coal output shows tangible gains. Carloadings rise 10.9 per cent over previous week, standing 13.8 per cent above the corresponding week last year. Steel operating with increased activity.

Prices notably better. Commodities near high points for recent months. All security markets participate in rising trend under large volumes of transactions. Whatever features the Roosevelt dollar may lack to make it an economic and ethical success, it is concededly a political triumph.

NRA Decision on Codes Awaited

WITHOUT any direct revelations by National Recovery Administration officials as to the probable nature of NRA action on the codes of the National Electrical Manufacturers Association or the National Electrical Wholesalers Association, hearings were adjourned late last week.

After consideration of testimony at the N.E.M.A. rehearing a resumption will be taken on January 29. Rumor has it that the New Deal passion for reform is again to be expressed in the demands of NRA as to how the code now operative shall be revised.

Objections to at least half the clauses of the proposed code of the National Electrical Wholesalers Association were voiced by S. F. Heinritz, representative of the Consumers Advisory Board in hearings before National Recovery Administration authorities in Washington, last week. As anticipated, a greater part of all the objections centered around the code provisions for underselling manufacturers and for absorption of cost by manufacturers. I. C. Fox of the National Dry Goods Association objected similarly. It was requested that such provisions be stricken out.

It is now up to General Johnson as to whether or not this code is to be granted as presented. According to E. Donald Tolles, managing director of N.E.W.A.:

> There are two elements that the administrator said must be taken into consideration before definitely acting on the electrical wholesalers' code. One of these elements is the fact that the general code for wholesalers, of which ours is a supplement, has not yet been signed by the President. We are told that the differential clause in that code is causing the delay. There is organized opposition to this clause in the general wholesale code by mail order, chain store and buying syndicates.
>
> The other element that the administrator feels should be taken into consideration before definitely acting on the electrical wholesalers' supplement is the fact that electrical manufacturers are applying for amendments to their basic code. Until it is definitely known whether these proposed amendments of the manufacturers are approved, the administrator in charge of our code will hesitate to grant approval, particularly to the section relating to underselling manufacturers.
>
> While we are awaiting final decision, we are continuing to build up an organization for administering the code throughout the country. In almost every one of the forty-two trading areas the personnel of the commissions have been suggested, and are only awaiting confirmation by our code authority as soon as the code is signed.

N.E.C.A. hearing scheduled

A public hearing on the proposed code of fair competition for the electrical contracting industry will be held by Deputy Administrator Malcolm Pirnie on Jan. 22.

The code provides that representative associations or groups of employers and employees within the industry, may establish by mutual agreement for a specifically defined region or locality the standards of hours of labor, rates of pay and such other conditions of employment, as may be necessary to effectuate the policy of the NIRA.

Notice has been given of a hearing to be held by NRA on January 26 on a supplemental code of fair competition for the lighting equipment subdivision of the fabricated metal products industry.

Arizona Power Extension

Substantial portions of outstanding securities of the Arizona Power Company, now in receivership, having already been deposited with the readjustment committee under the plan and agreement of readjustment dated October 11, 1933, the committee has extended the final date for deposit and is urging holders of undeposited securities to make deposit immediately. No definite time limit has been fixed, but in accordance with the agreement of readjustment the committee reserves the right to determine when sufficient securities have been deposited to make the plan

effective and to terminate without further notice the period within which holders may deposit their securities, announcement by the committee says.

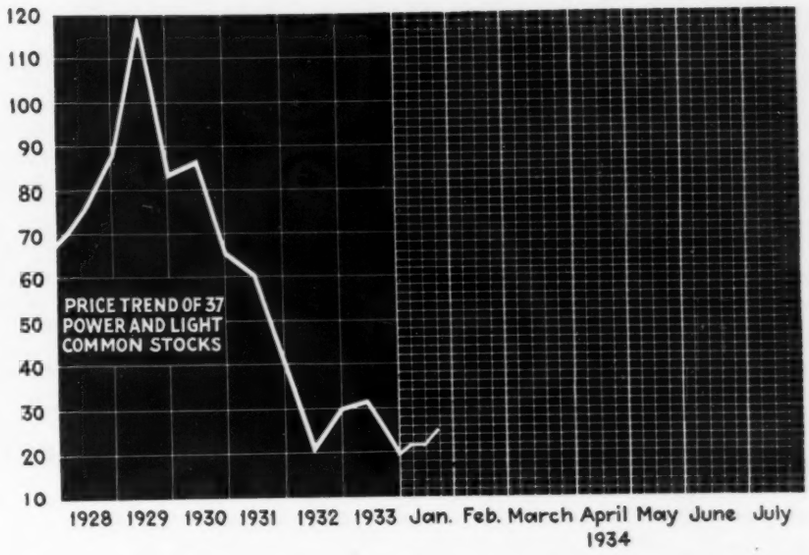
Security Owners Unite in New Utility Defense

Definite action to prevent the destruction of public utility values will be taken by the American Federation of Utility Investors, Inc., Chester D. Tripp, president, has declared in announcing a plan to organize the support of utility investors to combat present forces tending to undermine the industry and depress security values. Mr. Tripp states that "every destructive force that endangers the fair value of public utility securities will be vigorously opposed. It does not matter," he said, "if the destructive forces be set in motion by an act of government—federal, state or municipal—or by unscrupulous financiers and managers who have brought some of the units of the utility industry into disrepute."

Some seventy members have been formed into an advisory committee to represent all sections of the country and practically all lines of business activity and professions except the utility industry and investment banking. A national campaign is soon to be launched to arouse the interest of investors in utility securities to the present plight of the industry and by co-ordinated forces correct the situation.

A number of organizations with similar objectives have been in existence in this country for a number of years. Mr. Tripp is a consulting metallurgical engineer.

All Markets Sweep Upward



Violently stimulated by plans for the Roosevelt dollar, all security markets swept upward this week. "Electrical World" average for electric light and power common shares rose to 24.6, as against 21.1 for the previous week.

Court Upholds Associated Gas

Associated Gas & Electric Company this week won the right to solicit holders of its debentures in the State of Pennsylvania to join in its recently announced plan for a reorganization. Federal Judge W. H. Kirkpatrick issued an injunction restraining the Pennsylvania Securities Commission from interfering with the reorganization plans. The company has closed option 1 of its plan of recapitalization of debt, options 2 and 3 remaining open (ELECTRICAL WORLD, May 20, page 629).

Barstow Becomes Gilbert

With the purpose of identifying the organization with its president, E. M. Gilbert, directors of W. S. Barstow & Company, Inc., at a recent meeting voted to change the corporation's name to the E. M. Gilbert Engineering Corporation.

Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
Alabama Power (Year ended November 30)					
Gross earnings	$15,519,565	$15,744,360	— 1.4	49	48
Net earnings	7,908,994	8,233,300	— 3.9	..	..
Net balance	884,356	1,277,125	— 30.7	..	..
Consolidated Gas, Electric Light & Power (Eleven mos. ended November 30)					
Gross earnings	24,925,130	25,032,629	— 0.4	68	68
Net earnings	7,731,991	7,946,444	— 2.7	..	..
Net balance	4,117,748	4,461,977	— 7.7	..	..
Consumers Power (Year ended November 30)					
Gross earnings	25,975,324	28,323,636	— 8.2	56	51
Net earnings	11,390,343	13,818,917	— 17.5	..	..
Net balance	2,572,256	5,200,085	— 50.4	..	..
Georgia Power (Year ended November 30)					
Gross earnings	22,129,019	22,699,973	— 2.5	48	49
Net earnings	11,346,962	11,667,973	— 2.7	..	..
Net balance*	2,284,900	2,517,763	— 9.2	..	..
Kansas City Power & Light (Year ended November 30)					
Gross earnings	14,216,739	14,747,422	— 3.6	64	61
Net earnings	5,163,408	5,734,720	— 9.9	..	..
Net balance†	3,273,738	3,988,085	— 17.9	..	..
Ohio Edison (Year ended November 30)					
Gross earnings	14,730,163	15,803,772	— 6.7	49	47
Net earnings	7,517,860	8,350,892	— 9.9	..	..
Net balance	1,730,316	2,752,575	— 37.1	..	..
Tennessee Electric Power (Year ended November 30)					
Gross earnings	11,381,528	11,887,078	— 4.3	58	58
Net earnings	4,781,224	6,894,103	— 30.6	..	..
Net balance	565,987	814,784	— 30.4	..	..
Virginia Electric & Power (Year ended November 30)					
Gross earnings	14,671,511	15,587,146	— 5.9	66	64
Net earnings	5,067,445	5,602,788	— 9.5	..	..
Net balance	1,985,122	2,534,655	— 21.6	..	..

Holding Companies

	1933	1932	Per Cent Increase	Operatin Ratio 1933	Operatin Ratio 1932
American & Foreign Power and subsidiaries (Year ended September 30)					
Gross earnings	$55,199,126	$56,547,284	— 2.4	60	58
Net balance†	5,895,684	9,420,609	— 37.3	..	..
American Water Works & Electric and subsidiaries (Year ended November 30)					
Gross earnings	43,162,875	44,327,215	— 2.6	55	55
Net balance	2,391,504	3,029,353	— 21.0	..	..
Commonwealth & Southern and subsidiaries (Year ended November 30)					
Gross earnings	109,039,634	116,075,948	— 6.1	55	53
Net balance	470,484‡	5,528,599	—108.5	..	..
Northern States Power (Del.) and subsidiaries (Year ended November 30)					
Gross earnings	21,104,885	32,679,113	— 4.8	61	60
Net balance†	6,089,218	7,397,432	— 17.7	..	..

* After 1st preferred dividend.

† Before all dividends. ‡ Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net earnings—Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance—Balance available from income for common stock dividends.

New Canadian Project

Plans for a $15,000,000 hydro-electric development and irrigation scheme on the South Saskatchewan River, just north of Riverhurst, Sask., have been completed and application for permission to proceed with the project has been made to the Saskatchewan Department of Natural Resources and the Federal Department of Public Works. The proposed development includes construction of a reinforced concrete dam to back up a body of water 100 miles long in the valley of the river, construction of a 100,000-hp. electric power generating plant, construction of a 1,000,000-acre irrigation scheme and also facilities to provide 10,000,000 gal. of water for the cities of Regina and Moose Jaw if required.

Construction of 1933

Contracts for public works of the engineering type, according to a compilation by the F. W. Dodge Corporation, totaled $499,517,800 in 1933, a figure which was within 3 per cent of the total of $514,699,700 reported for this type during 1932. Awards for public utilities let during 1933 amounted to $103,204,800. This was a gain of almost 37 per cent over the total of $75,601,500 reported in 1932.

Major New Construction This Week

Heavy-duty motors, controls, regulators, conveyors, etc., will be installed by Standard Steel Car Corporation, Butler, Pa. Cost about $200,000.

Columbia City, Ind., plans installation of 1,000-kw. turbo-generator unit and auxiliary equipment for $116,600 extensions in city-owned electric light and power plant.

Hiawatha Brewing Company, Minneapolis, Minn., plans $175,000 addition.

Auburn, N. Y., has plans for city-owned electric light and power plant and electrical distributing system to cost $310,000.

Until February 5, Bureau of Reclamation, Denver, Colo., asks bids for twelve 96-in.-diameter emergency gates and twelve 84-in. needle valves for canyon wall outlet works, Boulder Dam, Boulder Canyon Project, Boulder City, Nev. (Specification 562).

Motors, controls, regulators, conveyors, etc., will be purchased by Queen City Textile Corporation, Allentown, Pa., for new mill. Equipment purchases will cost $140,000.

Forsyth, Mont., plans $135,000 city-owned electric light and power plant.

Schinner-Hofmann Brewing Company, Long Beach, Calif., will build $160,000 plant.

Federal Forest Service, Newport, Wash., to construct 16-mile transmission line from power station on Priest River to experimental plant.

San Angelo, Tex., has plans for municipal plant, using Diesel units. Fund of $880,000 being arranged.

Western Brewing Company, Seattle, Wash., to construct $200,000 plant.

Lorain, Ohio, will soon take bids for a $1,500,000 city-owned power plant.

Gold Clauses Complicate Payments

FOLLOWING the difficulties of the Bethlehem Steel Corporation with its coupon payments to foreign holders of bonds with special currency clauses, several utilities have reached various decisions. Organizations which have outstanding issues of bonds whose interest coupons are payable in any one of several currencies, at the option of the holder, have notified the New York Curb Exchange of their policies with respect to continuing to pay interest in funds other than American dollars. The Great Western Power Corporation of California will pay the January 1, 1934, coupon to foreign holders in sterling, provided that an affidavit be presented stating that the bonds have been owned and held abroad at least two months prior to the presentation of the coupons. To all other holders American dollars will be paid. The issue involved is the company's first mortgage 40-year 5 per cent sinking fund gold bonds due in 1946.

Baltimore holds to pact

Consolidated Gas, Electric Light & Power Company of Baltimore has announced that holders of its first refunding mortgage bonds, series G 4¾ per cent, due March 1, 1969; series H 4½ per cent, due July 1, 1970, and 4 per cent series, due 1981, have the option of obtaining the United States dollar face of their coupons by presenting them for encashment at the paying agencies specified in New York and Baltimore or they may obtain English sterling by presenting such coupons at the London paying agency. Coupon payments in London are made at the English sterling amount indicated on the face of the respective coupons.

Pennsylvania Water & Power Company has notified the Curb Exchange that the company intends to make payments of the coupons due January 1, 1934, on the first mortgage 5 per cent sinking fund gold bonds issued pursuant to the mortgage and deed of trust dated January 27, 1910, from this company to Irving Trust Company, trustee, in accordance with the terms of said mortgage and deed of trust so far as may be permitted by law, to the persons entitled thereto.

Canadian difficulties too

Power Corporation of Canada, Ltd., has authorized the Royal Bank of Canada to make payment in connection with the coupons of its 4½ per cent 30-year convertible debentures due 1959, and all subsequent coupons as and when they may become due, in American funds only to those holders who present the same for payment in New York and in sterling only to those holders who present their coupons at the London branch, and in the latter case at the fixed rate of exchange of $4.86⅔ to the pound sterling, and that all coupons presented at any branch of the bank in Canada are to be paid in Canadian funds.

Shawinigan Water & Power Company, regarding the payment of interest on its mortgage and collateral trust sinking fund gold bonds, series A, 4½ per cent, due 1967; series B, 4½ per cent, due 1968; series C, 5 per cent, due 1970, and series D, 4½ per cent, due 1970, has announced that coupons presented in Montreal will be paid in Canadian currency; those presented in New York will be paid in United States currency and coupons presented in London will be paid in sterling.

Quebec Power Company in regard to the payment of principal and interest on its first mortgage and collateral trust sinking fund gold bonds, series A, 5 per cent, due December 1, 1968, has announced that the principal and interest are payable at the option of the holder in either United States currency or Canadian currency at the fixed rates of exchange for such funds.

New York Metal Prices

	Jan. 9, 1934 Cents per Pound	Jan. 13, 1934 Cents per Pound
Copper, electrolytic	8–8.25	8.00
Lead, Am. S. & R. price	4.00	4.00
Antimony	7.25	7.25
Nickel ingot	35.00	35.00
Zinc, spot	4.60	4.60
Tin, Straits	51.875	53.00
Aluminum, 99 per cent.	23.30	23.30

Laclede Reports No Sales

All over nothing at all appears to be the verdict in the Federal Trade Commission-Laclede Gas Light Company pother about security representations under the new federal law (ELECTRICAL WORLD, January 13, page 97). Since the company distributed none of the bonds and the much-debated registration statement was withdrawn, the occasion for a hearing in the case was eliminated. The commission had charged misrepresentation in a company-answered questionnaire.

MEN OF THE INDUSTRY

F. M. Feiker New Secretary of Engineering Council

Frederick M. Feiker has been appointed executive secretary of American Engineering Council, with headquarters in Washington, D. C., to succeed Lawrence W. Wallace, resigned (ELECTRICAL WORLD, January 6, page 63).

Mr. Feiker brings to his new position

a unique experience in both private and public business. Since his graduation as an electrical engineer from Worcester Polytechnic Institute, in 1904, he has spent the first half of his business life in editorial and publishing work, having been consecutively editor and chairman of the editorial board of the A. W. Shaw Company of Chicago and editor and vice-president in charge of editorial policy for the McGraw-Hill Publishing Company.

Beginning in 1920, Mr. Feiker undertook a broader field of public service and was successively assistant to the Secretary of Commerce, operating vice-president of the Society for Electrical Development, managing director of the Associated Business Papers, Inc., director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce. During the past six months Mr. Feiker has been in charge of an inquiry into the needs and methods of developing trained men for the textile industry, in co-operation with the textile engineering department of our Northern and Southern educational institutions, under an educational grant from the Textile Foundation.

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ANDREW W. CRUSE of Ingram, Pa., has been appointed chief of the electrical equipment division of the U.S. Department of Commerce to succeed Marshall T. Jones. Mr. Cruse is a graduate of the United States Naval Academy. He has been identified with the Westinghouse Electric & Manufacturing Company, Westinghouse Machine Company, Bell Telephone Company and other manufacturing companies.

JOHN F. COLEMAN, consulting engineer of New Orleans and past-president of the American Society of Civil Engineers, was elected president of the American Engineering Council at the annual meeting held last week in Washington, D. C.

OBITUARY

William B. Potter

William Bancroft Potter, a pioneer in the electric traction field and for many years engineer of the railway department of the General Electric Company, died at his home in Schenectady, N. Y., January 15 after a short illness. Mr. Potter, who had retired in 1930 after 43 years of service, was 70 years of age.

A native of Thomaston, Conn., Mr. Potter entered the employ of the Thomson-Houston Electric Company at Lynn, Mass., in 1887 and upon the formation of the General Electric Company he joined that organization. In collaboration with W. H. Knight, he devised a practical type of street-car control apparatus known as the series-parallel control, which was marketed by his company and widely used. It was the underlying principle of most car control systems used since then. In

1894 Mr. Potter went to Schenectady and a year later was appointed the engineer of the railway department, the position he occupied until his retirement three years ago. In that capacity he was active in the electrification of the elevated lines in New York, the New York Central Terminal, the Great Northern Railroad, the Butte, Anaconda & Pacific and the Chicago, Milwaukee, St. Paul & Pacific.

Mr. Potter was a prolific writer of articles for the technical press and had to his credit 134 patents. He was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the American Society of Civil Engineers.

Giuseppe Faccioli

Giuseppe Faccioli, noted electrical engineer, died January 13, of pneumonia, at his home in Pittsfield, Mass., in his fifty-seventh year. Mr. Faccioli early became deeply interested in the high-

voltage transmission of power. In 1908 he became identified with the Pittsfield works of the General Electric Company, where his mathematical genius proved unusually valuable in all problems pertaining to the products of that plant. He also spent considerable time at Schenectady, where he was associated with the late Dr. Charles P. Steinmetz, whose researches in the field of lightning became famous. These studies were continued at Pittsfield by Mr. Faccioli and they contributed in no small measure to the success of the internationally known high-voltage laboratory. In 1930, because of ill health, he retired from his active duties as works engineer and associate manager of the Pittsfield works of General Electric, becoming a consulting engineer for that organization.

Mr. Faccioli was born in Rome, Italy, in 1877 and was graduated with high honors in 1899 from the Institute of Technology, Milan, as an electrical and mechanical engineer. His early American experience was secured in the New York Edison Company, Interborough Rapid Transit Company and the Crocker-Wheeler Company. His work soon attracted the attention of William

Stanley and it was not long before he was made Mr. Stanley's chief assistant in that pioneer's laboratories in Great Barrington, Mass. The Stanley laboratories were absorbed by the General Electric Company in 1906.

Mr. Faccioli had been an indefatigable worker in the American Institute of Electrical Engineers, having served upon some of its most important committees, on the board of directors and as a vice-president. The 1931 Lamme medal of the Institute was awarded to him for his contributions to the development and standardization of high-voltage oil-filled bushings, capacitors, lightning arresters and numerous features in high-voltage transformers and power transmission. In the course of his career he had written many technical papers on electrical engineering subjects and had received patents on various types of electrical equipment.

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CHARLES S. BREWER, formerly chairman of the board of directors of the Niagara Hudson Power Corporation, died at his home in Utica, N. Y., January 9. Mr. Brewer was one of the outstanding business men and bankers of the Mohawk Valley. He was born in Canton 64 years ago.

ALBERT CASPER, president and general manager of the Vallejo (Calif.) Electric Light & Power Company, died suddenly in San Francisco, December 9. Mr. Casper became connected with the company, which was started by his father, following his graduation from the University of California in 1908, and had been president since 1915. He also was active in the affairs of the Pacific Coast Electrical Association.

THOMAS A. MCLOUGHLIN, who had been recording secretary of the sales committee of the General Electric Company for 25 years, died at his home in Schenectady January 8, after a long illness. Mr. McLoughlin entered the Boston office of the Thomson-Houston Company in 1888. Four years later, when the Thomson-Houston and Edison General Electric companies were combined to form the General Electric Company, he continued in the Boston office. After performing various duties for the company in Schenectady and New York he became recording secretary of the sales committee in 1907, the position he held until his retirement in 1932. Mr. McLoughlin was 70 years of age.

LOUIS B. NUTTING, president of the Foster-Wheeler Corporation, died January 12 at his home in New York after an illness of several weeks. He was 62 years old. Mr. Nutting was president of the Power Specialty Company in 1927 when it was merged with the Wheeler Condenser & Engineering Company into the Foster-Wheeler Corporation and he continued as president of the combined organization.

T. HERBERT CLEGG, an electrical engineer for the Tennessee Valley Authority, Knoxville, Tenn., and an assistant to Llewellyn Evans, electrical engineer in charge of operations at Muscle Shoals, died November 20, in his forty-eighth year. Early in his career Mr. Clegg became identified with the Philadelphia Rapid Transit Company, where he engaged in the analysis of power plant statistics and economics and assisted in the supervision of power system operation. In 1918 he was appointed superintendent of power for the Northern Virginia Power Company, Winchester, Va., and after one year relinquished this work to become assistant to O. M. Rau, power specialist, engaged on investigation work in connection with power plants. Subsequently he served as special engineer for the Philadelphia Rapid Transit Company and the International Railway Company at Buffalo, N. Y., retaining these positions for several years.

CLINTON S. MARSHALL, for 24 years general manager of the Worcester, Mass., district of the American Steel & Wire Company, including plants at New Haven, Conn., and Trenton, N. J., died at his home in North Grafton, Mass., January 1, at the age of 73. He was born at Rutland, Mass., and entered the wire manufacturing field in 1879 at the Washburn & Moen Manufacturing Company's plant in Worcester. When this company was absorbed by the American company in 1900 Mr. Marshall became assistant superintendent of the cable-making plant at Quinsigamond, later being made superintendent and district manager. He was retired about four years ago.

NEW EQUIPMENT

Instantaneous, Time-Delay Plunger-Type Relays

A complete line of instantaneous and time-delay plunger-type relays for protection against overcurrent and undervoltage, and for use as auxiliary relays, has been announced by the General Electric Company. The same principle of operation is common to the entire line and depends upon the action of a magnet coil in attracting or releasing a plunger when predetermined values of voltage or current are present in the coil circuit.

The mechanical design is unusual, as the relays are all single-pole and include a variety of adjustments and convertible features. The instantaneous overcurrent relay can be changed from time delay on contact opening, contact closing, or both, by simply placing a poppet in the proper hole. Likewise, by simply turning a cap the air intake or outtake to the bellows can be regulated to change the time delay in the opening or closing of the contacts. Other features include the changing of hand-reset to self-reset contacts and from circuit-opening contacts to circuit-closing contacts.

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LECTROMELT 25-LB. FURNACES operated direct on 110 volts a.c. or with a transformer on 220, 440 or even higher voltage power supplies have been announced by the Pittsburgh Lectromelt Furnace Corporation, Pittsburgh, Pa. They have an extremely wide range of usability, such as melting, refining and alloying irons and steels, melting ferroalloys and non-ferrous metals and alloys, for fusion investigations and ore reductions, etc.

ANNOUNCEMENT OF A SMITHJOHNS JACK ANCHOR, an anchor with a powerful jack action, has been made by the Decatur Malleable Iron Company, Decatur, Ill. It is universally suited to all soils, including sand, gravel, shale and solid rock, it is claimed. Standard rods are used. The anchor is expanded by blows from a tamping bar or by twisting the rod.

A LINE OF MOTORS designed for protection against falling or splashing water has been announced by the Marble-Card Electric Company, Gladstone, Mich. These motors are fully inclosed excepting for small openings on the lower side of each end plate, which are so designed that splashing or falling water cannot enter the motor, and are made in both single-phase and polyphase squirrel-cage types up to 30 hp.

FRACTIONAL-HORSEPOWER SERIES-WOUND MOTORS for use on office devices, portable tools, portable appliances, etc., have been announced by the General Electric Company. These motors, designated as type P, are available with universal characteristics in most speed ratings and permit the use of the same motor on either alternating current, 60 cycles and below, or direct current. They are available in sizes covering the entire range of ratings from 1/100 to 1/3 hp. at speeds up to 10,000 r.p.m.